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ANNUAL MEETING  
of  
THE AMERICAN FARM ECONOMIC ASSOCIATION  
AUGUST 28-31, 1957, LAKE JUNALUSKA,  
NORTH CAROLINA

THE AMERICAN FARM ECONOMIC ASSOCIATION  
Volume XXXIX      DECEMBER, 1957      Number 5



# THE AMERICAN FARM ECONOMIC ASSOCIATION

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Entered as second class matter at the post office at Menasha, Wis. Acceptance for mailing at a special rate of postage provided for in the Act of February 28, 1925, paragraph 4, section 412, P.L.&R., authorized November 27, 1931. Printed in U.S.A.

THE JOURNAL OF FARM ECONOMICS is published five times a year during February, May, August, November and December by The American Farm Economic Association. Yearly subscriptions \$7. Published at Menasha, Wisconsin.



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**FELLOWS**  
*of the*  
**AMERICAN FARM ECONOMIC  
ASSOCIATION**  
**1957**





JOHN DONALD BLACK

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**J**OHN DONALD BLACK was born in Jefferson County, Wisconsin, in 1883. After graduating from Oshkosh Normal School in 1905, he was a high school teacher for two years before entering the University of Wisconsin, from which he received a B.A. degree in 1909 and an M.A. degree in 1910. From 1910 to 1915, he taught rhetoric, first at Western Reserve University, then at the Michigan College of Mines. By modern standards a latecomer to agricultural economics, he was in his early thirties before he turned to the field in which he was destined to become renowned. When he did so, however, he brought with him the richness of a liberal arts education and a strong belief in the value of language, mathematics, and other basic academic disciplines to later professional specialization—a belief which his own career has since fully confirmed.

After receiving his Ph.D. degree in agricultural economics from the University of Wisconsin in 1919 he served as Professor of Agricultural Economics at the University of Minnesota from 1918 to 1927 and, from 1921 to 1927, as Chief of the Division of Agricultural Economics as well. During this period, he was a leader among agricultural economists in bringing to the then almost wholly practical fields of farm management and agricultural marketing the valuable analytical tools of general economics, particularly through his pioneering book, *Introduction to Production Economics* (1926). In this remarkable publication, he anticipated many of the developments in the general economic theories of production and the firm which were to become familiar ground to all well-trained economists within the next decade.

The brilliant combination of the practical and theoretical brought him to Harvard University in 1927 and ultimately the presidencies of both the American Farm Economic Association (1932) and the American Economic Association (1955). At Harvard he became increasingly involved in the difficult and controversial arena of farm policy. Although one of the intellectual fathers of the Agricultural Adjustment Act of 1933, he proved to be an able and constructive critic of the agricultural price-support policies which later evolved politically from that basic statute, and he has been constantly involved, as both author and advisor, in the development of farm policy.

"Doctor" Black—as many generations of Harvard graduate students affectionately came to call him—always had time to serve as their stimulant, father-confessor, and kindly prod, but scrupulously avoided making them into unquestioning disciples without minds of their own. At the same time, Professor Black long exerted strong intellectual leadership and influence over the profession at large. While his scorn for slipshod research methods and inferior products has not always endeared him

(Continued on page xxiii)



THOMAS NIXON CARVER

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**T**HOMAS NIXON CARVER was born in Kirkville, Iowa, in 1865. His life span thus extends back almost to the beginning of officially sponsored and organized research and teaching in agriculture in the United States. He did his undergraduate work at Iowa Wesleyan and at the University of Southern California, from which he received an A.B. degree in 1891. After taking part of his graduate training at Johns Hopkins, he went to Cornell where he received his Ph.D. in 1894. He was granted an honorary LL.D. by Oberlin in 1905 and by the University of Southern California in 1929. To these was added an honorary Litt.D. from Iowa Wesleyan in 1932.

Professor Carver taught at Oberlin College from 1894 to 1900 in the rank of associate professor. Following the publication of several outstanding articles in professional journals, he was brought to Harvard as an assistant professor of political economy in 1900 and was advanced to a full professorship in 1902. He continued in that position until his retirement in 1932. During this period, economics was emerging as a recognized field of learning, and Professor Carver, along with Frank W. Taussig, John Bates Clark, Richard T. Ely, and other leaders of that period, took a prominent part in its development. His most important early work was *The Distribution of Wealth*, published in 1905. It was followed by other books in the field of general economics, some with an emphasis on philosophical and sociological aspects which became more prominent in his thinking as he grew older; among them were *Essays in Social Justice*, 1915, *Economy of Human Energy*, 1924, *The Essential Factors of Social Evolution*, 1933, and *The Religion Worth Having*, 1939. Interspersed with these were his *Principles of National Economy*, 1921, and *This Economic World*, 1927, as well as numerous short articles both in professional journals and in popular media.

Professor Carver early became interested in the emerging field of agricultural economics and, along with H. C. Taylor, George F. Warren, Benjamin H. Hibbard, and others, helped to pioneer this new field of specialization. This interest found expression in his *Principles of Rural Economics*, published in 1911, which for many years was used as a text in agricultural economics. He was an early and effective contributor to the development of the American Farm Economic Association, especially after it shifted emphasis from farm management to a broader concern with the economic problems of agriculture generally. He became its president in 1926. He served as secretary-treasurer of the American Economic Association from 1909 to 1913 and as its president in 1916.

During his years at Harvard, Professor Carver taught graduate and undergraduate courses in agricultural economics and, in the later years,

(Continued on page xxiii)





JOSEPH STANCLIFFE DAVIS

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**J**OSEPH STANCLIFFE DAVIS was born in 1885 in Frazer, Pennsylvania. After studying at Harvard University, from which he holds a doctoral degree, he taught economics at Bowdoin College in 1912-13, at Harvard in 1913-17, and in 1915-20 served there as a tutor in history, government, and economics until 1921 when he entered the Food Research Institute at Stanford University. With his rare scholarly gifts and increasing skill, he developed this independent research organization in food and agricultural economics, served as one of its directors devotedly for 30 years until academic retirement in 1951, and contributed much to its democratic spirit and empirical research tradition.

Throughout his professional life, Joseph Davis has served—aside from his work as teacher and researcher—both international and national public agencies. During World War I he was with the American Shipping Mission and later the Allied Maritime Transport Council in London. In 1928-31 he served as Chief Economist of the Federal Farm Board. In his retirement, he has continued to apply his mature judgment and statesmanship to the most active of all his services as a member of the President's Council of Economic Advisors in Washington, D.C., an assignment which he has been fulfilling since May 1955.

Dr. Davis has rendered unique services to the profession of agricultural economics by setting high standards of intellectual achievement with his unerring integrity in the search for truth in his meticulous and painstakingly careful research, by his uncompromising courage in voicing his creative doubts and his scholarly convictions—irrespective of their momentary unpopularity—particularly in matters of research methodology and agricultural policy, and by his wise and well-tempered counsel on national and international affairs.

His critical reading of scholarly manuscripts continues to be widely sought and deeply appreciated. In his distinguished career he has been honored by election to the presidencies of the American Farm Economic Association, the American Economic Association, and the American Statistical Association, and has served all terms with accustomed devotion and efficiency. For four years he was a member of the Board of Directors of the Social Science Research Council.

Among his many lasting services as the author of books, contributions to books, brochures, and articles in economic journals, his published research reports on the unexpected population upsurge in the United States stand out as uniquely revealing the caliber of his intellectual contributions.



GARNET WOLSEY FORSTER

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GARNET WOLSEY FORSTER was born in Rexton, New Brunswick, Canada, in 1887. He received his B.S. degree from Cornell in 1914. Being interested in further study he enrolled at the University of Wisconsin where he received the M.S. degree in 1917 and the Ph.D. degree in 1923.

A combination of excellent training, keen insight, and good judgment, has called Dr. Forster to many responsible positions. While taking graduate work at the University of Wisconsin he served also as assistant in agricultural economics. World War I interrupted his service in the field of agricultural economics as he served his country with distinction both in the United States and the AEF in France, particularly in the Vosges Sector and the Meuse-Argonne. In 1920 he was appointed Professor of Agricultural Economics at the University of Kentucky, but because of outstanding ability and wide knowledge was soon called to Washington as Assistant Chief in the office of Farm Management and Farm Economics of the U.S. Department of Agriculture; one year later he was Acting Chief of that office. Yielding to his desire for college work, however, he left the service of the federal government in 1923 to become Head of the Department of Agricultural Economics at North Carolina State College of Agriculture—a position he held until his recent retirement.

While at North Carolina State, Dr. Forster not only conducted wide programs of research and teaching, but with characteristic energy and a tremendous storehouse of knowledge found opportunity to do some writing. In addition to numerous bulletins he authored *Farm Organization and Management* revised in 1953, and was the senior author of *Elements of Agricultural Economics* published in 1950; both of these books are widely used as texts and standard reference works.

Dr. Forster served as a consultant to the Farm Mortgage Conference in 1930-31 and after World War II was a leader in helping to establish the Southeast Land Tenure Research Committee. He not only served as chairman of this committee but contributed in many other ways to its accomplishments. For many years he has been a member of the American Farm Economic Association and the Southern Economics Association.

A brief biographical sketch cannot set forth adequately the influence of Dr. Forster in the field of agricultural economics. Not only have his views and ideas (as reported in articles, bulletins, reports, books and talks) added tremendously to the basic knowledge and practical application of farm economics, but his keen sense of humor has made him a favorite at conferences and workshops throughout the country.





ASHER HOBSON

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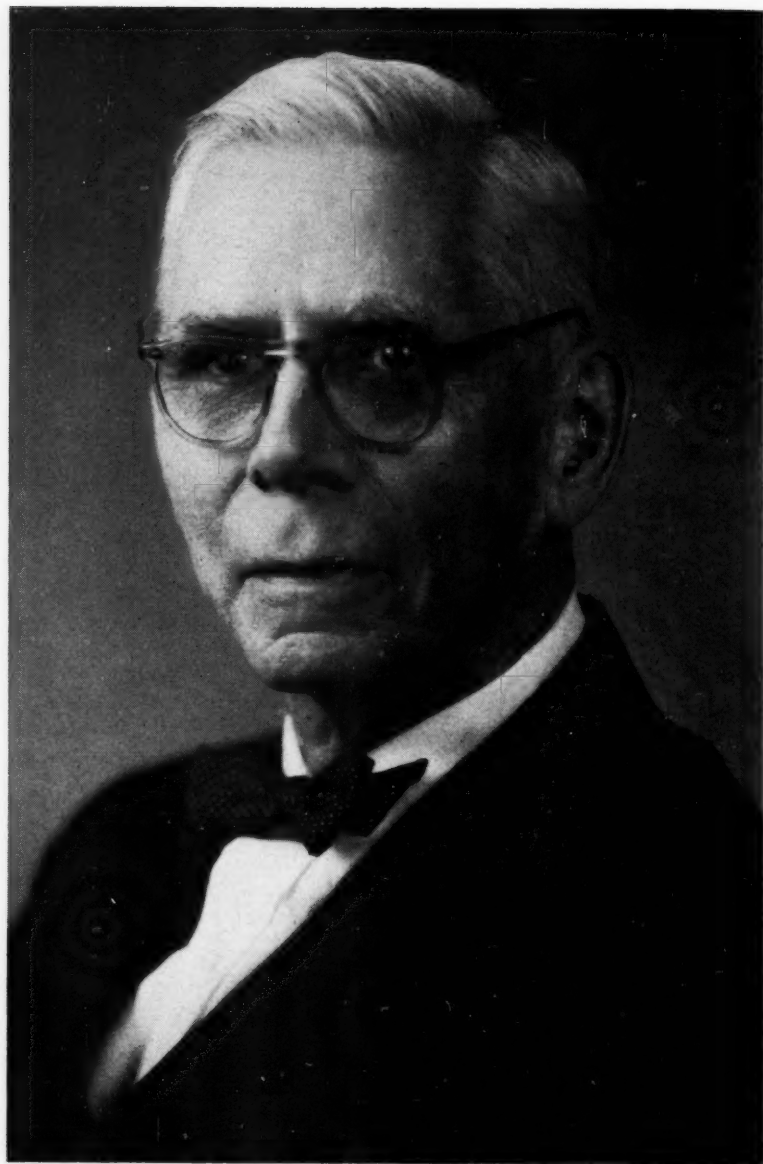
**A**SHER HOBSON was born in Quenemo, Kansas, in 1889. He received his B.A. degree from the University of Kansas in 1913, his M.S. degree from the University of Wisconsin in 1915, and his Doctor of Political Science degree from the University of Geneva (Switzerland) in 1931.

After service as director of markets for the State of Washington from 1917 to 1919, he entered the U.S. Department of Agriculture as Assistant Chief of the Office of Farm Management. He was appointed Associate Professor of Agricultural Economics at Columbia University in 1920. From 1922 to 1929 he served as the American delegate to the International Institute of Agriculture in Rome. He was consulting economist with the Federal Farm Board from 1929 to 1930 and Chief of the Division of the Foreign Agricultural Service of the U.S. Department of Agriculture from 1930 to 1931. In 1931 he became Professor of Agricultural Economics at the University of Wisconsin where he served as chairman of the Department from 1931-48, becoming Emeritus Professor in 1953. His principal interests have been agricultural marketing, agricultural cooperation, and farm policy. He has contributed numerous papers, bulletins, and circulars to these fields such as: "The International Institute of Agriculture" (University of California Press, 1931); "Cooperation: Principles and Practices" (Wisconsin Agricultural Experiment Station, 1952); "Agricultural Survey of Europe: Switzerland" (U.S. Department of Agriculture, 1929).

Asher Hobson was a member of the United States Council of the International Conference of Agricultural Economists from 1930 to 1946 and became Chairman in 1947. In 1944 he was named a member of the Board of Trustees of the American Institute of Cooperation and served as Chairman of the Board from 1949 to 1952.

Asher Hobson's contributions to agricultural economics have been of supreme quality through the years. He was one of the first to call the problems of international trade to the attention of agricultural economists. He has been a vigorous proponent of individual freedom and initiative as has been reflected in his long-time work and interest in cooperatives. He has served the American Farm Economic Association well as President in 1947, and for fifteen years (1932-46) with unstinted devotion as its Secretary-treasurer.

Since retirement Asher Hobson has maintained his interest in public affairs, serving as consultant and advisor to the U.S. Department of Agriculture, the State Department, and to farm organizations. He has also been active in preserving the culture and practices of early American agriculture in part through the development of "Little Norway" at Mount Horeb, Wisconsin, and the promotion of an agricultural museum at the Wisconsin College of Agriculture.



EDWIN GRISWOLD NOURSE

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**E**DWIN GRISWOLD NOURSE, economist, educator, author, and government counsellor, was born in Lockport, New York, in 1883. He holds degrees from Cornell University, the University of Chicago, and the Illinois Institute of Technology. He served successively as instructor in finance at the Wharton School of Finance and Commerce at the University of Pennsylvania, Professor and Head of the Department of Economics and Sociology at the University of South Dakota, Professor and Head of the Department of Economics and Sociology at the University of Arkansas, Professor of Agricultural Economics and Chief of the Agricultural Economics Section at Iowa State College, Director of the Institute of Economics of the Brookings Institution, Washington, D.C., from 1923 to 1942, and Vice President of the Brookings Institution from 1942 to 1946.

In 1946, Dr. Nourse became the first chairman of the newly created Council of Economic Advisors in conjunction with the Office of the President of the United States. In this capacity, he pioneered a new function in government. With a seasoned judgment possessed by relatively few, he was uniquely able to focus his lifetime of experience in economic analysis on governmental policy.

After leaving the Council of Economic Advisors in 1950, he became a Senior Fellow with the Guggenheim Memorial Foundation where he has continued his creative writing and his lecturing on subjects dealing with governmental and national economic policy.

Dr. Nourse's contributions to the literature of agricultural economics have been frequent and stimulating. He is the author of eleven books among which are: *Agricultural Economics*, 1916; *American Agriculture and the European Market*, 1924; *Price Making in a Democracy*, 1944; *The 1950's Come First*, 1951; *Economics in the Public Service*, 1953; and has contributed numerous articles to economic journals and periodicals.

Dr. Nourse has been an active member of the American Farm Economic Association for many years, serving as its president in 1924. Eighteen years later, in recognition of his manifold talents, he was elected President of the American Economic Association. He served as Chairman of the Social Science Research Council from 1942 to 1945, as Vice Chairman of the Joint Council of Economic Education, and as a member of the American Philosophical Society, the American Academy of Arts and Sciences, and the League of Nations Committee on Nutrition. He is a member of Alpha Zeta, Phi Kappa Phi, and Pi Gamma Mu.

As one of the senior statesmen among agricultural economists, Dr. Nourse has for many years inspired others in agricultural economics. He has incessantly pioneered the arduous pathway that agricultural eco-

(Continued on page xxiii)



THEODORE W. SCHULTZ

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**T**HEODORE W. SCHULTZ was born in Arlington, South Dakota, in 1902. He moved rapidly through high school and college, completing high school in 1924 and receiving his B.S. in 1927 from South Dakota State College and his M.S. and Ph.D. by 1930 from the University of Wisconsin.

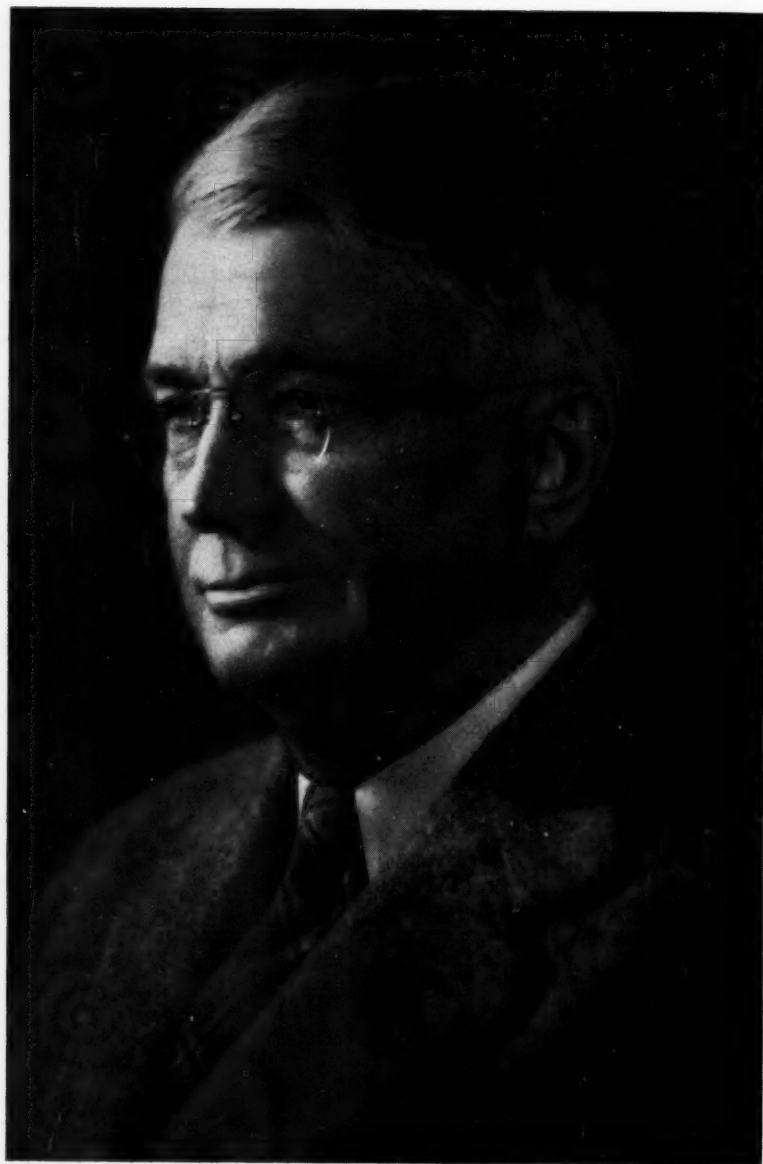
In 1930 he went to Iowa State College serving as Head of the Department of Economics and Sociology from 1934 to 1943. His imagination and initiative helped develop a strong research and graduate center in agricultural economics at Iowa State College. By adding able economists, encouraging cooperative work in statistics, and conducting interdisciplinary evening seminars, he greatly stimulated broad and active programs of research, teaching, and extension. His leadership gave strong emphasis to the application of economic and statistical theory to agricultural economics. Important national and international problems received much attention.

In 1943 he joined the Department of Economics at the University of Chicago, becoming Chairman in 1946. Under his chairmanship the Department has become a leading center for training in agricultural economics, while maintaining its outstanding position in more formal economics.

His nonacademic work is equally distinguished. He is, or has been economic adviser or counselor to many different government agencies, foundations, and other groups interested in public affairs. Among these are the Departments of Agriculture, Commerce, State, and Defense, several congressional committees, the Federal Reserve Board, CED, FAO, NPA, Twentieth Century Fund, and the Ford Foundation. His contributions to these groups have been many, especially as he used his incisive intellect in clarifying and integrating points of difference, in planning programs, in stressing needed improvements, yet, always maintaining a well-balanced perspective.

He has traveled extensively to Europe, Latin America, Russia and India. His many books and articles have been widely adopted through the years both by students and his professional colleagues. His contributions to the profession have been great, but even greater is his influence on the students and associates who have been stimulated by the power of his ideas and example.





HENRY CHARLES TAYLOR

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**H**ENRY CHARLES TAYLOR was born at Stockport, Iowa, in 1873. Following two years (1891-93) at Drake University, he entered Iowa State College receiving a B.S. degree in 1896 and an M.S. degree in agriculture in 1898. He studied at the London School of Economics in 1899 and during 1900-01 spent one semester each at Halle Wittenberg University and the University of Berlin. Returning to the United States, he received a Ph.D. degree from the University of Wisconsin in 1902. He thus became one of the first broadly trained scholars in agriculture and economics to enter the field of agricultural economics. He became Chairman of the Department of Agricultural Economics in 1908 and remained at the University until 1919.

His breadth of view of the field of agricultural economics was demonstrated when, upon becoming Chief of the United States Bureau of Agricultural Economics in 1921, he developed a well-rounded organization, including a wide range of agricultural economics research and extension activities. His books include: *Introduction to Agricultural Economics*, published in 1905, and *Outline of Agricultural Economics*, 1925. He was co-author of *World Trade in Agricultural Products*, 1943, and of *The Story of Agricultural Economics*, 1952. He was President of the American Farm Economic Association in 1920.

Following his retirement as Chief of the Bureau of Agricultural Economics in 1925, he joined the staff of Northwestern University as Professor of Agricultural Economics and Research Associate of the Institute of Research in Land Economics and Public Utilities. From 1928 to 1931 he directed a comprehensive survey of rural Vermont and served as a member of the Commission of Layman's Foreign Mission Inquiry in 1931-32. From 1933 to 1935 he was the United States member of the permanent committee of the International Institute of Agriculture at Rome, Italy. In 1935 he became Managing Director of the Farm Foundation, retiring in 1945 but continuing as Agricultural Economist with the Foundation until 1949. He continues his interest in world-wide agricultural affairs by traveling in England; he attended the International Conference of Agricultural Economists in Finland in 1955 and visited Japan in 1956 for independent agricultural economics research. His activities included membership in a number of professional and educational societies and service on several public committees. He has been awarded two honorary degrees, LL.D., Wisconsin, 1933, and Dr. of Political Science, Freiberg, 1953, and was presented a Distinguished Service Award in 1956 by Drake University.

For several decades he has participated in developing the discipline of agricultural economics and its influence on education, research, and public administration through articles, bulletins, reports, and speeches.

By his stature and counsel as the dean of agricultural economists of the United States and his early recognition of the international solidarity of this great profession, Dr. Taylor has made an outstanding contribution to its intellectual advancement and standing.



FREDERICK V. WAUGH

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FREDERICK V. WAUGH was born in Burlington, Vermont, in 1898. He received his B.S. degree from Massachusetts College in 1922, and his Ph.D. in economics from Columbia University in 1929. He worked in the general area of agricultural marketing in the Northeast from 1922 to 1928. He joined the staff of the old Bureau of Agricultural Economics in 1928 and remained with that agency until 1941, directing the research in marketing from 1935 to 1941.

During and following World War II he served in various advisory and administrative posts: with the Agricultural Marketing and the Food Distribution Administrations from 1941 to 1945, with the Office of War Mobilization and Reconversion from 1945 to 1946, and with the Council of Economic Advisors from 1946 to 1951. Since 1951 he has directed the work of the Division of Agricultural Economics in the Agricultural Marketing Service.

He was elected President of the American Farm Economic Association in 1946, received the Association's award for the best article in the *Journal of Farm Economics* in 1952, and edited the book, *Readings on Agricultural Marketing*, published under the sponsorship of the Association in 1953.

He is best known professionally for his keen ability to apply economic theory to problem solving, and for his rare capacity to develop theoretical concepts and analytical techniques. His accomplishments in the use and development of economic analysis are numerous and varied: they include the conceptualization of the food stamp plan, the use of the concept of consumer surplus in studying the consequences of price variability, the application of linear programming methods to resource allocation problems in agriculture, pioneering efforts to quantify consumer indifference curves, and numerous mathematical proofs of economic and statistical theorems.

He is best known to his colleagues, however, for his wise and friendly counsel. The young and the old, the well-known and the little-known, all come to talk with Fred Waugh, and all are graciously received and welcomed. This advice and counsel has inspired many a young man, and set many a more experienced man straight. This is his great and lasting accomplishment as a colleague and friend.



MILBURN LINCOLN WILSON

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MILBURN LINCOLN WILSON was born on a farm near Atlantic, Iowa, in 1885. He received his B.S.A. from Iowa State College in 1907, his M.S. from the University of Wisconsin in 1920, and his D.Sc. from Montana State College in 1935. In addition, he received a D.Agr. degree from North Dakota Agricultural College in 1940 and an LL.D. from the University of Rhode Island in 1952. Soon after graduation from Iowa State College, he settled on a homestead in Montana and farmed until 1910, when he became Assistant Agronomist at Montana State College.

In 1912 he became one of the first county agents in Montana. He then served as State Extension Leader in Montana from 1914 to 1922, and as Extension Economist at Montana State College from 1922 to 1924.

While in charge of farm management research in the U.S. Department of Agriculture from 1924 to 1926, he encouraged development of the case method in agricultural economic research. He also became interested in establishing experimental farm units for research on farm management, credit, and tenure problems. This interest led to establishment of the "Fairway Farms" experiment in Montana. In July 1926 he returned to Montana as Head of the Department of Agricultural Economics and leader of the Fairway Farms Project and served in that capacity until 1933.

During the drought and depression years, 1930-33, he was active in the development of programs for farm relief and took a leading part in the development and discussion of the domestic allotment approach to agricultural adjustment. When the Agricultural Adjustment Act was passed in 1933, he became Head of the Wheat Section of AAA. In that position he insisted on democratically elected farmer committees for local administration of the AAA program. Later that year he was persuaded to organize the Division of Subsistence Homesteads in the U.S. Department of the Interior. In 1934 he became Assistant Secretary of Agriculture, and in 1937, Under Secretary. While serving as Under Secretary he sponsored lectures and seminars on economic and social problems, and encouraged wide participation in the seminar discussions. His book, *Democracy Has Roots*, grew out of these seminars.

He became Director of Extension in the U.S. Department of Agriculture in 1940, and was also responsible for the nutrition programs of the War Food Administration. He continued as Director of Extension until 1953. Since that time he has been active in international technical assistance programs with the Ford Foundation and other agencies.

He was elected President of the American Farm Economic Association in 1925. His outstanding contributions to agricultural economics have



been the pioneering of case and experimental methods in economic research and the use of economic tools to guide education and other programs designed to promote the welfare of farm people at home and abroad. But his interests have ranged beyond the field of economics. Philosophy and anthropology have given him deeper insight into the nature of agricultural economics. His abiding faith in democracy and in the potentialities for improvement of rural life throughout the world have provided both inspiration and challenge to his co-workers. As one of five recipients in 1947 of the first "Distinguished Service Awards" to be granted by the Department of Agriculture, he was cited "for his leadership in pioneering ideas and in developing programs that have greatly improved farming methods, encouraged democratic group action, and enriched the qualities of rural life."

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## JOHN DONALD BLACK

*(Continued from page iii)*

to the recipients of his criticism, American agricultural economics today is eternally indebted to him for the effectiveness and vigor of his critical influence upon its development as a field.

Today, as a Professor Emeritus at Harvard and as "elder statesman," Professor Black not only continues his writing and advisory activities at home but takes the benefit of his wise and mature judgments in agricultural affairs to foreign lands. Like Marshall, Pigou, and Knight in the broader field of economics, Professor Black is in many respects among "the last of the generalists"—almost omniscient and omnipresent—in agricultural economics.

## THOMAS NIXON CARVER

*(Continued from page v)*

a course in rural sociology as well. He was director of the Rural Organization Service, U. S. Department of Agriculture, in 1913-14, and advisor to the Department in 1914-15.

After his retirement from Harvard, Professor Carver moved to the Los Angeles area but not to a life of idleness. He served as visiting professor at the University of California at Los Angeles in 1934-35 and again in 1938-39. He held a similar position at Occidental College in 1939-40. Two of his books were published after his retirement. In addition he maintained an active contact with the Los Angeles Chamber of Commerce and served as a member of its Board of Directors. He also served on the governing board of the Insurance Owners' League. He received the Asa V. Call Achievement Award in 1932.

## EDWIN GRISWOLD NOURSE

*(Continued from page xiii)*

nomics has traveled during the past four decades in its attempt to attain professional maturity. During those years, he helped to establish the young and growing discipline on the firm foundation of complete and objective analysis, intellectual integrity, and dedication to the preservation and strengthening of a progressive agricultural economy in a dynamic and expanding America.

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# JOURNAL OF FARM ECONOMICS

Volume XXXIX

DECEMBER, 1957

Number 5

AFFAIRS OF THE AMERICAN FARM  
ECONOMIC ASSOCIATION

HARRY C. TRELOGAN\*

*Agricultural Marketing Service, USDA*

**A**GRICULTURAL economists have little reason for complacency. They might recall the words of Dickens in opening his "Tale of Two Cities":

"It was the best of times; it was the worst of times.  
It was the age of wisdom; it was the age of foolishness.  
It was the epoch of belief; it was the epoch of incredulity.  
It was the season of light; it was the season of darkness.  
..."

Much of American agriculture is prosperous, but segments of it are not. The national economy is regarded as prosperous and growing at a satisfactory rate; but agriculture in relation to it is not faring well in terms of income. Agricultural economists have faced more immediately pressing problems in the past, but current problems may be regarded as more difficult to handle and more important in shaping the future of farming.

The present impasse in the development of farm policy is not accompanied with any feeling of assurance that a durable equilibrium has been attained. New factors have to be brought into the equation to correct imbalance. The factors have not been adequately assimilated by economic analysts so that reliable policy guidance is available. Farm leadership, in consequence, is asking for aid to fix a position and to box a compass so that a clear majority can be persuaded to pursue a definite course. Unlike war and depression emergencies where immediate needs provide obvious guides to policy, longer-run objectives based on fundamental values, need to be spelled out to establish policies we can afford in times of peace.

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\* Address of the President-Elect, American Farm Economic Association, August 29, 1957.

The report of the Committee on Agricultural Economics of the Social Science Research Council, on "American Agriculture and Agricultural Economics, 1955-1975," collates current problem areas requiring analytical attention. Profound questions are posed on how agriculture can adapt to accelerated economic growth and new technologies.

The address delivered by H. Brooks James last year sagaciously cited improvements in theoretical concepts and analytical tools required by agricultural economists to become better equipped to search for the answers.

All of these indicate opportunities for agricultural economics and agricultural economists, and emphasize the propriety of repairing our gear to gird our profession for important work ahead. An effective professional association should heed such challenges by preparing itself to aid the response. As one phase of preparation, we might tidy the affairs of our Association so that it may be assured of strength to continue a program of activities designed to further the efforts of our membership in conducting agricultural economic research, teaching, and extension. So, today, let us talk about our Association, its functions, membership, finances, and some parts of its history that have relevance to the present and the future.

These discussions too often are buried in business meetings that are sparsely attended. Too often they are presented by a departing president in hope they will benefit his successors. Too often the hope is unrealized.

The occupant of an office characterized as President-Elect has occasion to reflect on such matters before he assumes custodianship of the Association program. The happy arrangement whereby the President-Elect has the advantage of a year's service on the Executive Committee and the presidential prerogative of addressing the annual meeting *before* taking the helm provides an excellent opportunity to invite you along some paths of thought where your officers would appreciate your company.

At the outset we should recognize that our association is in a period of transition. You as members should participate in decisions to accept or to reverse some of the trends. I propose to give you that opportunity. I propose to do so (1) by pointing up current problems, (2) by discussing relevant factors to be taken into account in coping with them, (3) by suggesting some specific actions to take now, and (4) by exploring your views on alternatives we must decide in the near future.

### *Current Problems*

Our Association has been operating with a deficit for the past three years. Our budget for this year includes a capital depletion item of

nearly \$10,000. These facts in themselves are important, but are not cause for immediate alarm because of mitigating circumstances. This year's budget includes a non-recurring item of some \$8,000 for publication of a handbook. The net cost for this item may prove to be less than the estimate. Some of it, I understand, will be deferred to the coming year. But even with this item eliminated from consideration, an operating deficit would still be indicated. We are not threatened with an immediate financial crisis because accumulated assets are still substantial. They are of such proportions that preceding presidents have recommended we plan on alternate periods of small surpluses and deficits.

We have arrived at a point where a reversion to an operating surplus would appear to be order. We have an obligation to listen to admonishments of early officers of the Association. A prolonged struggle to make ends meet accounted for a statement in the foreword of the first number of the *Journal of Farm Economics*: "The finances of any association are usually the sum and substance of its success or failure." Evidently repeated pleas for payments of dues and for expanded membership, plus repeated needs for reducing the size of the *Journal* and curtailing activities left strong imprints upon the minds of subsequent officials. A number of these, notably Asher Hobson and L. J. Norton, resolved to place our Association in a position of financial security and they diligently pursued financial policies to that end. They accumulated a series of modest surpluses and prudently invested them for the Association. Capital gains from these investments have helped to insure against an early repetition of financial straits. Income from the investments has helped to sustain our activities for a number of years. I expect these men exerted their efforts with confidence that succeeding officers would retain the gains they had achieved. I think we should respect this obligation.

Among the solutions that will occur to you will be: expand the membership and raise the dues. Neither of these solutions is appropriate unless we are prepared to amend our sights somewhat. In any event we are confronted with a definite need to increase our income or to reduce our expenses.

### *Membership*

Let us first examine the membership situation. This year we have a total of memberships and subscriptions of 3,119, of which nearly 2,000 are regular individual members. This represents the culmination of rather steady growth over a long period, but the 1956 membership increase of 439 was substantially greater than any previous annual increment. It has brought us to a stage where a serious question arises as to whether we can continue to rely upon unpaid officials, especially for the offices of Secretary-Treasurer and Editor. In other words, with further growth we may no longer be able to get by with the payment

of the equivalent of first-class railroad fare to the annual meetings as compensation for these officers.

At this point I went to call attention only to the magnitude of costs potentially involved in a transition to paid officials. At salaries commensurate with the caliber of men we would want, and with appropriate office accommodations and secretarial and clerical services, a budget twice the size of our present one could easily be envisaged. Only part of the increased cost would probably be offset by revenue producing services which paid officers might conduct for the Association.

Complete transition to a self-supporting basis would entail much more since we are also dependent on host institutions for significant portions of costs for annual meetings and other activities. At best a gradual transition could be contemplated as needs develop for additional services to accommodate larger membership.

### *Dues*

Let us next introduce the subject of raising dues. Action was taken at our last business meeting authorizing the Executive Committee to raise dues from the current \$7.00 annual rate to as high as \$10.00. Before exercising this authority several factors merit consideration. Even though our dues may be regarded as modest compared with other associations, a rise in dues is somewhat inconsistent with an effort to expand or retain membership. Inasmuch as the marginal cost of publishing the *Journal* is less than current dues, the retention of membership might be more profitable than raising prices depending on the elasticity of demand. Perhaps of greater importance, however, is the question of who among our clientele will be affected most. If the drop-out in response to higher dues is greatest among the most recently graduated or more recently employed or the lower-paid groups of agricultural economists, the Association may alter the character of its membership in a manner inconsistent with its past aims. Understand, I am referring to groups ineligible for the junior membership which is now available at \$3.00 per year.

### *Functions of Associations*

This brings us to consideration of what are our objectives, our means of implementing them, and our desires for changing either the ends or the means. We may begin with the proposition that the role of our Association is essentially to serve the membership. Ultimately, the Association, through its members, aims to benefit American agriculture in the agribusiness sense, including in addition to farmers those who furnish supplies and services to them and who process and distribute their products.

Specific aims and activities may be altered from time to time as con-



ditions warrant. Our objectives at any particular time represent the current state of reconciliation of views held by the membership. A review of our history indicates that a number of issues have been contested from the very beginning. Starting with the argument between farm management and farm economics the problems have changed from time to time. As our profession grew our perspective broadened and several distinct specializations developed. When our name was changed from the American Farm Management Association to The American Farm Economic Association, signifying that the original argument was resolved, it was apparent that research and teaching were the interests represented. Since that time our constitution has been changed to reflect interest in extension and there has been recognition of the interests of persons engaged in commercial activities.

Executives of the Association have a responsibility to ascertain what is wanted and to exercise judgment on how to meet the wants. They are expected to lead and to guide and to consult the membership regarding future activities and policies. Both guidance and consultation are improved with understanding of our underlying purposes.

All professional organizations share the rather ubiquitous characteristic of being designed or intended to promote mutual interests of members or participants and to improve the quality or quantity of services performed by the membership. They have the objective, too, of improving remuneration for such services. Differences in approaches and in emphasis given to the respective objectives account for the major distinctions among these organizations.

Professional societies range so widely in their objectives and activities that clear delineation between them and the other types of organizations is difficult. As a rule, professional societies employ less direct or more subtle means to acquire benefits for the individuals who comprise their membership. Their programs feature activities designed to aid those in quest of improved knowledge or performance of duties probably with the conviction that such improvements will ultimately advance the profession and be reflected in better professional opportunities.

A professional scientific society usually originates as an organized effort to promote and facilitate fundamental work leading to the creation of a body of principles and theory in a particular subject. As professions grow, a heterogeneity of interests develops and two types of cleavage arise. One involves the development of specializations within fields of subject matter to the point where the parent association gives inadequate attention to the specialized interests, causing separate organizations to be formed. The other cleavage involves division between research workers and practitioners related to a subject matter field. Al-



though membership of the scientific society tends to be more closely identified with academic institutions while the practitioners' group tends to be closely identified with private enterprise, teachers become associated with both types. Teachers tend to affiliate with the association that more nearly treats the subject matter from the standpoint of the type of courses they are teaching, that is, basic or principles courses versus applied or practical courses.

Observation of growth and proliferation of professional societies is useful to us in suggesting the wide array of activities in which we might engage and in evaluating these activities as they relate to our present state of growth. A society does not subdivide until it is sufficiently large to support separate organizations. A problem confronting the American Farm Economic Association is one of appraising its present stage of development, for our growth has approached the point where alterations may be required.

Expansion of membership with higher dues can best be achieved if the greater resources can be used to resolve the problem of adequately serving different constituent interests within the profession. The devotion of more attention to particular group interests would probably over-tax the endurance of officers who must depend on other work for a living. Our present method of operating requires substantial subsidy from academic and research institutions that permit their staff members to serve as our officers. Until we are prepared to launch out on our own, we must keep objectives consistent with the expectations of the institutions that support us.

Since an increase in dues is likely to curtail rather than expand membership among the younger men being employed in academic work, enlargement of membership will probably need to be directed toward new clientele, the most likely of which would be in the commercial area. To attract more practitioners in this area we would need to alter our services to more nearly meet their needs. It is doubtful whether the potential membership would be sufficient to support paid officials properly equipped to handle the added duties likely to be entailed.

Up to now we have followed the pattern ascribed to groups primarily interested in scientific research and teaching. This contributes to higher quality of work by fostering activities designed to increase the output or to improve the performance of our members. For this purpose greatest reliance is placed on facilitation of communications among members. To aid our decisions on adjustments to be made, it may be well for us to examine the basic values we feel are forthcoming from our Association and how our activities relate to them.

*Functions of the American Farm Economic Association*

The American Farm Economic Association provides means for keeping abreast of the growth of knowledge in agricultural economics. Through the *Journal*, annual meetings, and to a limited extent the sponsorship of books, our membership is apprised of theoretical concepts, applications of theory and different points of view on policy issues relevant to farm management, agricultural marketing, publicly administered farm programs and related statistical, financial and economic developments.

Means are provided for establishing acquaintanceship with colleagues located throughout the world. In addition to annual meetings intended to facilitate both comprehensive and detailed discussions for this purpose, meetings are arranged each year with allied social science societies to broaden these opportunities. Student chapter activities and news notes in the *Journal* also help to establish and maintain personal acquaintance.

The Association provides a forum in which the individual agricultural economist may participate so that his abilities and achievements may be measured by those whose judgment he respects. A basic need and motivation of any scientist is to receive recognition and deserved esteem from those best able to judge the quality of his work. A sense of self-fulfillment of his life purposes is more likely to come from a group of contemporaries who have experienced the training, the disciplines and the skills he himself has devoted a lifetime to acquiring. Such recognition is one of the essential life values and is prized more when it comes from a critical rather than from a mutual admiration society. Most recognition is granted through reactions of the members to contributions made by other members. For this the Association provides the environment in which the actions and reactions occur.

Each year some 300 individuals are given an opportunity to present their materials through the facilities of annual meetings and the *Journal*. Most of the papers represent the results of research, most of which is conducted in public institutions for public benefit, or they represent information useful to those engaged in relevant research and teaching. To the extent that these presumptions are valid, beneficiary institutions are warranted in supporting the Association on the grounds that it offers opportunity for publication of the institutions' work and improves the capabilities of staff members.

The Association goes further, however, to provide opportunities for formally recognizing individuals for work well done. In part, recognition comes through the democratic process of electing officers, but this method has several distinct limitations for taking cognizance of professional

achievements. Personality attributes, administrative abilities, and opportunities for establishing widespread personal acquaintanceship weigh heavily in swaying popular polls. Such factors, however, may be of little importance as determinants of contributions to scientific advance. Awards each year for outstanding theses, for published reports, and for the best *Journal* article are more in keeping with the function of recognizing meritorious work. All except one of these awards are limited to younger men and help to identify and to lend encouragement to potential leaders of the profession. The election of fellows, being inaugurated this year, will more adequately recognize cumulative achievements. To overcome limitations cited in election of officers, different methods for selection of fellows will be presented for your consideration.

Every professional society accepts some responsibility for perpetuation and promotion of the profession. We respond to this urge with encouragement of student chapter activities, membership drives and publicity services. None of these, however, assumes substantial proportions in our activities. Of the three, student activities appears to evoke more active and continuous interest from the membership. Over a period of several years your officers have strived to contrive a student activity program attractive to undergraduate and graduate students. We are not satisfied with the results of our efforts. We are still seeking ideas and leadership from the ranks of teachers among us.

Heretofore our main contribution to the promotion of agricultural economics abroad has been confined to what amounts to a subsidization of membership in our Association. There is subsidization because we charge the same rate for foreign and domestic subscriptions to the *Journal* when in fact the expense of foreign mailing is much more costly.

Beginning this year we have entered into a contract with the International Cooperation Administration to further facilitate overseas membership, particularly among persons from countries in Asia and the Far East who have studied in this country. By paying a nominal fee of \$2.00 which is supplemented by a payment from I.C.A. these people will be given corresponding membership through which they will receive the *Journal* and other services designed to encourage continuity of interest in the subject they studied while they were here.

#### *Proposed Revision of Constitution*

Several changes in our constitution are needed to make it harmonize with actions taken at annual meetings and with established practices. A committee comprised of John Brewster, Chairman, Harold Breimyer and Bushrod Allin have kindly responded to a request to examine these needs by preparing a proposed revision. The revision is intended to

conform with the purposes, programs and methods we now have, except for the time for counting ballots, which now presents a cumbersome problem. Other substantive changes involve (1) providing that changes in annual dues be determined at the annual meeting, instead of requiring an amendment to the constitution which was neglected last year when a change of dues was authorized; (2) deleting specific provisions for local chapters, of which we know of none; and (3) omitting specific provisions for life memberships, of which there is only one.

### *Other Possible Changes*

Let us now survey possibilities for other changes. Implementation of our objectives rests mainly on publication of a *Journal*, conduct of annual summer meetings, arrangement of joint meetings with social science associations each winter, a series of activities to recognize meritorious work, and a few limited promotional services. A number of incidental services include employment services, publication of a roster, encouragement of local chapters, and public relations activities. These have apparently been regarded as less important in obtaining the principal values we seek.

Societies bearing reasonably close kinship to our own perform still other services such as publishing popular bulletins and bibliographies of current literature; sponsoring lectures, seminars, symposia, or training programs in specialized subjects; and affiliating with other national or international scientific bodies with kindred interests. These might be considered potentially useful to us.

A questionnaire on which you may indicate your opinions and preferences regarding a number of alternative means for achieving a balanced budget will now be distributed. Your cooperation in completing the questionnaire is requested so that your officers may be better informed about your attitudes and views on these issues.

My discussion has been intended to stimulate your interest in our Association affairs and to aid your judgment in providing guidance to your officers. I trust this visit together may be mutually beneficial as our Association proceeds toward completion of a half century of dignified service to science and agriculture.

## ADDRESS BY THE SECRETARY OF AGRICULTURE

EZRA TAFT BENSON

*U. S. Department of Agriculture*

I COUNT it a pleasure, an honor and a privilege to be your guest at this annual meeting of the American Farm Economic Association. I understand that your organization is nearing its fiftieth anniversary. These have been fruitful years; you have built a body of economic principle, you have made many applications to current problems, and you have much advanced the cause of economic understanding. I congratulate you on your achievements. The unsolved problems, which are many, should not blind us to the good that has been accomplished.

Many economists from the Department of Agriculture appear on your program, along with economists from the various colleges and universities and with economists from private life. This symbolizes the fruitful union of public and private efforts and of cooperation at all professional levels.

My training to a degree at least is in the field of agricultural economics, so I count myself as one of your group. A non-paying member, shall we say! I plan to repent! I trust that by thus associating myself with the professional economists I shall not damage your public relations or mine.

One of my first acts as Secretary of Agriculture was to direct an appeal to our land-grant colleges and other institutions for advice and suggestions on problems of farm policy. I asked that the understanding of professional economists be made more and more a part of our common fund of knowledge. The response to this appeal was most helpful in our efforts to deal with the problems then facing American agriculture.

I appear before you today to renew this appeal. Agriculture still faces grave problems, and still needs the best brains, the best imagination, the best scientific help that professional economists like yourselves are so well qualified to offer. The market for ideas is still wide open. We have made progress in attacking our problems. But further strenuous efforts will be needed before we can consider them resolved.

As a background for this appeal, let me review these problems as I saw them five years ago and as I see them today. Let me start by placing them in historic perspective briefly.

Farming in America has never been an easy way of life. I need not dwell upon the hardships faced by the pioneers who settled our great country, who brought it under cultivation, who laid the foundations for the highly efficient agriculture that we know today. They accepted the toil of subjugating a wild but fertile land. They met the hazards of untamed nature—of drought and flood, of storm and blizzard, of insects and disease. They suffered in addition the hardships of an unstable economy,



rife with speculation, exploited by monopoly, with recurrent depression and collapse of markets. But they forged ever forward.

Always there have been complaints. But always there have been those who survived tribulation, mastered the problems that beset them, and built for the future that we inherit today. These hardy, self-reliant folk, with their fortitude and courage, have been a main source of the spiritual strength that has enabled our Nation to make such great progress.

Let us look now at more recent history—the period of the last 40 years, since World War I. This is the period out of which grow the problems that face us today.

The first World War saw a substantial expansion in farm production. It was followed by an economic collapse—difficult but short-lived for most of the economy, difficult and prolonged in the case of agriculture. I was just getting started in farming during that period—with a young family and a heavy debt load. After a decade of adjustment, agriculture appeared again to be getting on its feet, when world-wide depression engulfed our whole economy, with particularly devastating consequences for farmers.

This was the origin of our so-called “emergency” programs. Undertaken in the name of “adjustment,” they launched the regimentation and controls that still plague agriculture today. They are barriers to the adjustments they were supposed to promote.

One can perhaps justify the steps then taken in view of the urgency of the problems farmers faced. One cannot reconcile their perpetuation. Less than a decade after they were inaugurated they were in grave trouble. Surpluses were mounting, while farm prices and incomes remained at a fraction of the “parity” that represented the goal of the programs. Only the catastrophe of World War II sufficed to inflate prices and turn into a blessing the accumulated surpluses that were about to engulf the farm program.

The stimulus of war set loose a flood of technological progress—a flood dammed up during the poverty of the depression years. Production increased rapidly. Our needs were met. American farmers demonstrated to the Nation and to the world their ability to respond to the call of emergency.

But the fear of post-war depression haunted the thoughts of those entrusted with responsibility for the welfare of agriculture. They enacted into postwar legislation a system of regimentation and control whose inadequacy should have been quite evident from prewar experience. American agriculture emerged from the second world war encumbered with policies and programs whose inevitable consequence was to prevent rather than promote the economic adjustments obviously required. These



programs were developed in an effort to meet the needs of serious depression and modified to meet the needs of war. Today we have neither depression nor war.

To cushion against hardship is one thing. To price ourselves out of markets, to accumulate huge, unmanageable surpluses, to seek the illusion of prosperity through large and increasing obligation of public funds, is quite a different thing. These programs were based upon unsound economics, and, as I believe time has shown, unsound politics. Their inevitable outcome could only have been a rationing of poverty for agriculture.

Agriculture must not be placed on the political auction block. Agriculture is not for sale to the highest bidder.

We must remind ourselves that a government warehouse is not a market. When a commodity is put into government storage there are only three possibilities.

It can be released in the domestic market, in competition with current production, and so reduce domestic market prices.

It can be disposed of abroad, with the attendant dangers of displacing normal sales and antagonizing friendly foreign nations. Even exports are limited.

It can be allowed to spoil, a thing the American people will not tolerate.

When a farmer turns over his crop to the government, he may transfer the title but he has only partially transferred the problem.

Farmers want to produce for markets, not for government bounty.

The present Administration continues to struggle to release agriculture from the regimentation that binds it, to restore to farm prices the flexibility that is necessary for adjustment, to eliminate rigid formulas, to unfreeze the inventories frozen in government hands. With the support of those willing honestly to face these problems, we are winning out in this struggle. But critical problems still remain for forging the forward-looking policies and programs that will see us through to our goals.

What are these goals? Let me enumerate them with you, as I saw them five years ago, and as I see them today.

We seek an agriculture which is prosperous, expanding and free.

We seek to maintain a family-type agriculture, operated by free and self-reliant men and women.

We seek an agriculture in which technological advance is encouraged, and continuous adjustment made to it, so that farmers have a continuing incentive to high efficiency rather than being penalized for their progressiveness.

We seek an agriculture that provides for its family operators a return

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properly related to their contribution, an agriculture which provides for our farm people an opportunity to share fairly in our nationally rising levels of living.

We seek an agriculture that recognizes the need to conserve soil, water and forest resources against the requirements of future generations, an agriculture in which farmers have the incentive to use their resources wisely.

We seek the extension of progress to under-developed rural areas, to whose people must be opened opportunities for full employment of their abilities rather than subsistence on inadequate farms.

We seek to achieve these goals through the effective operation of the private economy, not through regimentation, control, and dictatorship by the Federal government, not through Federal subsidization and intervention in the market. The Federal government should encourage and aid, it should provide and extend research guidance, it should establish the institutional framework for progress and fair dealing. But it must not become the major support, it must not usurp the function of local effort, initiative, and leadership.

Farmers have the right to seek prosperity through their own efforts, individually and cooperatively. They must not have to depend upon Federal appropriation for their income.

Some will say—some do say—that these objectives cannot be attained. I refuse to believe this. American ingenuity and initiative have overcome equally difficult problems in the past. I am confident that this spirit still persists, and that it will win out.

Yes, we are making progress.

Consider these facts:

Farm prices are at the highest level they have been during the past three years—gains achieved in the market, not through price supports.

Farm income is increasing for the second consecutive year—the only two peacetime increases during the past decade.

Exports are at the highest levels in history, both in terms of volume and in terms of dollars.

Government investment of farm products has been reduced by one-sixth from the all-time peak reached in early 1956.

Tenancy is at an all-time low; the percentage of farms owned by those who operate them is at an all-time high.

Sixty-five percent of the farms are free of mortgage debt. Total farm debt is equal to only 11 percent of total farm assets.

Serious problems exist. Of course they do. I do not deny it. But agriculture is coming through this postwar readjustment with less difficulty and less hardship than was experienced after any other major war.

Some say that the family farm is obsolete and that it must disappear in our highly organized, highly technical, highly specialized economy. To them I say that the family farm has always been in danger in our changing economy. But it has always adapted to the changing conditions that faced it. Through ingenuity and initiative family farmers have forged these new tools; among others:

- the land-grant college system of research and extension,
- protection against monopoly,
- improved credit facilities,
- improved tenure arrangements,
- cooperative association for procurement and marketing.

Always the family farm has stood the test, and it remains today the overwhelmingly dominant form of organization of agricultural production in our land.

The family farm has new problems to meet today and will have still others tomorrow. It is easy for the negative-minded to picture these problems as unsurmountable. But I am confident that application of the same positive, constructive imagination that has won through in the past will continue to surmount the difficulties that beset family farming. We can maintain and advance this efficient institution so that it will continue as a great bulwark and mainstay of our republic.

Again, some say that technical progress in agriculture inevitably results in production outstripping demands, so that farmers inevitably face inadequate markets, chronic surpluses, and sub-standard incomes under normal, peace-time conditions. To them my answer is the same: that a positive, imaginative effort to build markets and to gear production to them, plus emphasis upon cost-reducing improvements in production and marketing, will in the future, as during most of our history, find solutions to this problem. How? Through private initiative rather than through continuing government controls and subsidy.

Some insist that the situation in rural areas of low income is hopeless, that people in these areas have no chance to pull themselves up by their own boot straps. Only through wholesale taking over by the federal government, it is said, can conditions in these areas be improved. To them I reply that "pulling oneself up by one's own boot straps" is a tradition of our great nation—one of the traditions that make it great. The federal government can aid this process, through information, through advice, through encouragement, through helping pilot areas devise and demonstrate the way. One of the outstanding examples of this fact is right here in North Carolina.

This is the approach of our rural development program. It refuses to make the people of these areas permanent wards of the state. It seeks

to build upon and strengthen, rather than to eradicate, the "boot-strap" tradition. Again, positive imagination and initiative among the people themselves provides the driving force.

Our farm people, to me, are the salt of the earth. They probably know more than anyone that "as ye sow so shall ye reap." They need the opportunity to share properly in the great social and economic gains our country is making. Given parity of opportunity, our farmers will themselves solve many of the problems that now perplex their government.

I have set forth several goals that we seek for American agriculture. I have mentioned some of the difficulties that lead the pessimists to despair of achieving these objectives. I have set forth a more tough-minded, more imaginative approach, that keeps faith with our traditions. Throughout this discussion is a philosophy, yes, a faith, if you will, that I hold and cherish—a faith in the absolute, the resolute strength and self-reliant initiative that is a basic characteristic of our farm people.

This is our greatest, our over-all, our ultimate goal, to which all the others I set forth are merely contributory. We must restore, nurture, and preserve this strength, this self-reliance, this ingenuity and initiative. We must set it free, we must support and encourage it, confident that in it lies not only the ultimate solution to today's and tomorrow's specific problems, but also the most precious and enduring foundation of our form of government. These, above all, are what we seek.

We must present the strong as well as the weak points of the free enterprise system. We should not be apologetic about the system that has given us freedom and material wealth unmatched at any time in history or at any spot on the globe.

It is to again enlist your aid in this great quest that I come before you today. Economists—for, as I said, I include myself among your numbers—have a vital contribution to make toward this goal. We shall make it, not as representatives of "the dismal science" of hopelessness and despair. Rather, we shall make our contribution as scientists of ingenuity and imagination, who lend our minds and our ideas to forging the tools with which to preserve and recreate the goals we seek. In this we shall be keeping faith with our own traditions—the traditions that have marked our profession as outstanding in its contribution to human progress.

And now, in closing, I wish to leave a challenge with you.

There is a tremendous opportunity for professional economists to do sound educational work in the economic field. I mean basic economic education, outlook work, work in the field of farm policy—yes, government policy. Let me ask this question:

Why is the Department of Agriculture besieged with requests for Federal programs which would cripple our free institutions? Is it that

farmers want controls or that they wish to be dependent upon the Federal government? No! The difficulty is that the operations of basic economic forces are often so poorly understood. The consequences of unsound farm programs are not foreseen. The capabilities of our free institutions are not appreciated.

There is grave danger in an economy which is centrally planned and heavily subsidized by government. There is the obvious danger that the government plans may fail or the taxpayers grow weary. There is the more subtle danger that enterprise, weakened by excessive reliance on government, may lack the vigor and self-reliance necessary to reestablish itself. There is danger we may lose, unwittingly, the priceless blessing of freedom.

Farm people need to know the long-run as well as the short-run consequences of public policy in agriculture.

Traditionally, professional economists have been reluctant to enter the area of public policy. That is understandable. They have not felt direct responsibility in this sphere. They have realized the dangers of becoming involved in an area so controversial.

Yet a number of institutions seem to be doing outstanding work in this field.

Can any of us disown responsibility? Does not the possession of useful knowledge in itself involve the responsibility of sharing it with others?

Objective work can be done in this field without becoming politically involved. Research can evaluate past programs and appraise new proposals. Teaching can provide fundamental training in economic relationships and in farm policy as an essential to good citizenship. Extension can present factual information. The economic consequences of various courses of action can be explained objectively, courageously. Outlook information can help farmers make needed adjustments, on their own, without programs of Federal control.

People cannot think in a vacuum. Without factual information, public discussion is but the pooling of ignorance.

There is no greater need today in agriculture than a courageous, objective presentation of the economics of farm policy. The challenge is yours—the obligation also.

I do not ask you to accept or to favor the policies and programs in which I believe. Although I believe it would be good for America if you did just that.

I should feel more confident in the courses we adopt if I have the assurance that they are being critically reviewed in a scientific sense.

But my appeal is not for help to me as an individual. I only ask that you accept the responsibility for helping farmers and the public gener-



ally to gain a true understanding of the facts involved in agricultural policies and programs.

The real forward progress in this world is made by those who recognize opportunity, who accept responsibility, who rise to meet a challenge. I know of no other group which holds a greater potential contribution for sound public policy in agriculture than this one. The significant contributions you have made in the past are proof of this fact. As you return to your fields of labor may God bless your work as you carry on the high traditions of your profession.



## RESOURCE USE AND AGRICULTURAL POLICY

Chairman: Joseph Ackerman, Farm Foundation

### RESOURCES NEEDED IN AMERICAN AGRICULTURE

JOHN D. BLACK  
*Harvard University*

I HAVE interpreted the title of this paper, which is exactly as President James assigned it to me, to mean resources needed not in 1957-1958, but in the future. I hope I have interpreted him correctly.

So being, I have had to make a choice as to how far in the future to look ahead. In general, I have followed the Paley Commission's report on "Resources for Freedom" and have centered my projections on 1975. But I have not stopped with this. I have considered the course of change between now and 1975, and after 1975 as far as the year 2000 and beyond. The chances are very good, of course, that, given normal expectancy of life of my age, I will not be alive to see how well my projections are realized even well this side of 1975; and surely not long thereafter, even if I had the iron constitution of Thomas Nixon Carver, now 94. But our religion teaches us that everything is bliss in the next world, so that, unless I am more of a "heller" than I think myself to be, I do not need to worry over any torment of my soul if these projections turn out to be widely astray.

And perhaps I need to say over again to this group what is said these days about all projections of this sort, namely, that they are not forecasts. Instead, they are statements of what will happen if a given set of assumptions are realized. These assumptions are carefully stated in my paper.

The discussion that follows begins with the factors determining our agricultural resource needs. I felt that I needed to analyze these before I had any real basis for determining what the resource needs will be in 1975 and after.

#### *Factors Determining Agricultural Resource Needs*

I think you will also agree with me that the agricultural resources we are going to need in 1975 and after will depend upon the kind of a society we want our nation to be, upon the goals we set for our nation. This becomes at once apparent when we take up the major factor determining agricultural resource needs, namely, the size of the population to be fed, clothed, and otherwise supplied with farm products. Shall our goal be to maintain an ever-growing population regardless of how well it lives, or shall the nation at some point in time slacken or even

level out its population growth so that its level of well-being can keep on rising?

But population growth is only one of a whole set of factors determining future agricultural resource needs. A closely related determinant is income per capita and the part of this income that is going to be spent for farm products as they leave the farm.

Next, account must be taken of how much of our farm product is going to be exchanged for imports of all descriptions, and also of how long and how far we are going to go in disposing of farm products abroad outside the usual channels of trade.

Another factor is the development of industrial uses of additional farm products, which is somewhat balanced by the opposite effect of a coming fuller or more efficient use of food and given products. Both of these prospects were explored by a special commission of this year's Congress. Included in the first is the possible introduction of new crops that can be put to industrial uses—like castor beans, safflower, or sesame. Combined with the latter is the possible increased derivation of feeds, food, and fibre from nonagricultural sources like the sea, and from chemical sources like the urea now being fed to cattle.

More important than any of the foregoing, however, except population numbers, is the efficiency with which the resources are used, the outputs per unit of the resources singly and combined. This applies to natural resources like land, but even more to human resources and capital goods. Again, an important factor in efficiency of use is that the use be directed toward different products and services in proportion to the want or need for them. We are wasting a lot now because of our surpluses.

Finally, we must not forget that we shall continue to have a good many families—a million or more of them—with their homes on small pieces of land but producing little for the market. They prefer living in the country and surely we need to give them a chance to do so.

Let us now consider the changes ahead with respect to these factors, population growth first. This serves best to illustrate another important differentiation, that between the short run of a decade or so and the longer run of, say, a half century or more. We will consider what this means with respect to the current practice of building models of the economy at some cut-off date like 1965 or 1975. These models can be built with sufficient realism to influence many decisions only for relatively short-run time spans. Even then, they require that some of the major determinants be assumed quantities. But it is highly important that these quantities be reasonably based on some such evidence as the projection of trends. Another category of required assumptions is the exclusion of such disturbing events as wars and severe business depres-

sions. The rest of the models and most of their components are derived by determining past interrelationships and transplanting these in the new assumed environment ten, fifteen, or so years in the future. In all the short-run models for the whole economy that I have studied, population growth has been one of assumed determinants, usually the middle of the several Census Bureau projections being chosen. The report of the Paley Commission of 1952 followed this practice in assuming a population of 193 million in 1975, a 28 per cent increase over that of 1950. But in 1955 the Census Bureau revised its projections, and its B projection became 215 million. This revision was necessary because marriage and birth rates had remained higher than was projected earlier. This B projection assumes that the average birth rates of 1950-53 will continue to 1965, and that the birth rates will then decline linearly to the prewar level by 1975. If they were to continue at the 1950-53 rate till 1975, the 215 million would be 221 million.<sup>1</sup>

Any statement of the resource needs of American agriculture in 1965 or 1975 can be no more certain than are these projections of population and of other determinants of resource needs listed above. Nevertheless, it seems wisdom to make these projections and to set up a model of what the economy will be like at the end of these short-run time spans given that the nation pursues a set of chosen goals. The alternative, as stated earlier, is merely to drift.

But what about the longer time spans? It seems to be the judgment of most economists and economic statesmen that model building for longer periods is not worth while. At least, they engage in it to only a limited extent. The reason for this is simply that one cannot possibly know what mankind may or may not accomplish in the use of natural resources and the harnessing of nature's forces within, say, the next fifty years, and in the better ordering of its own affairs both nationally and internationally. Recent developments in the releasing and use of atomic energy have made longer-span model building look even more vain than it did a decade ago.

Although it may be useless to build long-span economic models, this does not mean that some exploration of longer-run developments, projected into the next century, will not furnish useful guidance in current decisions. Otherwise, we will have to say that economic history has no real reason for being studied, except, of course, to satisfy historical curiosity, which, after all, is the real reason for much historical research. One major distinction between the analytical process in these two cases is, however, important. With short-run model building a reasonable

<sup>1</sup> *Current Population Reports*, Series P-25, No. 123. Bureau of the Census.

attempt can be made to quantify the findings, even to the point of population numbers, labor force, acres of land in crops, consumption of dairy products, and the like. With longer-run projections, the analysis has to be largely qualitative; that is, one has to be content with definition of trends, concepts and interrelationships, and nothing more than relative magnitudes at the most.

The foregoing is well exemplified by the case of population numbers. One can calculate, for example, that at recent rates of growth, the population of this country will increase two-thirds by 2000 and more than double by 2025. But will the population continue to increase at these rates? Those who expect our economic growth to continue at its present booming rate mostly see no reason for any decline in marriage rates and children per family. Others of them expect the demand for better housing, clothing, education, recreation, and the like to press so hard on the weekly pay check and the national income that a reduced fraction of it will be spent for food and farm-grown fibres, and that family size will decline in consequence. Then there are those who expect output per worker not to decline, but to slow up in its rate of increase. Moses Abramovitz in his 1955 American Economic Association paper concluded that the productive resources used per person has been increasing at a declining rate since the 1870's. Along with this the net product per person has increased at a slightly greater rate because product per man-hour has been increasing. His analysis indicates a further decline in rate of increase in resources used and of net output per person. It even suggests eventually a considerable levelling off of these increases.

The pertinent qualitative analysis singles out two parameters of the population part of this problem; namely, the rate of increase in productivity, and the rate of rise in levels of living. The interrelations of these are complex and vary with the stage of civilization. But in a country that is clearly above the Malthusian stage, the level of living never retreats except temporarily in emergencies such as wars and severe depressions. What happens instead is that if productivity gains slacken, the rate of population growth declines. The import of this is that once a people has attained a certain level of living, and has held it long enough so that it becomes the standard of living of this people, it does not surrender this except in emergencies, but instead slows up its rate of population growth whenever its rate of technological advance slows down. The meaning of this for the future of the United States is that if our rate of technological advance slows down, as Abramovitz expects, so will our population growth.

But how soon can we expect this slowing down? We are living just now in a period of sharp recovery from the set-back in the 1930's and

probably cannot reasonably expect the high rates of productivity gain of this period to continue unabated much longer. Rates at least as high as the projection of the long-run trend-rates from 1880 to 1950 are, however, reasonable to expect in 1970-75. Also, if the absorption of resources in military spending can be reduced by half, and the peaceful uses of atomic energy make large headway, we may even find ourselves close to a projection of the gains from 1934-43 to 1944-53. The Census Bureau's population projection A of 221 million in 1975 virtually makes this assumption.

But some slowing down of the rate of population growth can reasonably be expected after 1975, if not sooner, and considerably more after 2000. This will be in spite of a probably lesser slowing down of the rate of advance of levels of living. The reason for this is that advances in technology and productivity will not be great enough when applied to limited natural resources to yield a volume of output that multiplies geometrically as does population. The natural resources that will probably be relatively most scarce at this stage will be, first, some of the minerals and fuels, then water, then land. How scarce power will be, of course, depends upon progress with atomic energy and the like. Conceivably it could be cheap enough to make the use of ocean water economical inland along seashores.

How levels of living operate to check population growth is important to sense fully. The main part of this is that as more and more of the families making up a population group come to value better living more highly than more children, they limit the number of their children. At the same time, young people postpone marriage for such reasons. More education usually raises the rating given to better living.

The foregoing is by no means all of the population story, even in the United States. Low income and poorly educated people commonly lack knowledge of the means of control of family size. This is particularly important in many foreign lands. Rural families in most parts of the world are more nearly self-sufficing than urban families and the rural people have larger families. Perhaps 40 per cent of the world's population is living under Malthusian conditions, with virtually no rise in the levels of living. As for another 15 to 20 per cent, technology is gaining enough to permit a slight rise in living levels. For the remaining 40 to 45 per cent technology is advancing clearly faster than population, and living levels are clearly rising. Each nonwar decade sees some shift of population groups upward in this scale. Notable recent examples of this are in Italy and Quebec since the end of the last war. There is hope in this outlook for some relief of pressure of population on resources outside the United States, except in the still Malthusian areas. The



leaders of Communist China have suddenly awakened to the need for smaller families.

The foregoing has pertinence for the problem in hand in what it means in terms of exports and imports. If the conflict between the Communist and Democratic blocs can be much lessened and if the barriers to international trade are lowered, this country will both export and import more in relation to total output. Our levels of living and population increase will hold up a little better in consequence. The same will be true for the countries that trade with U. S. We will import more from tropical regions, especially those products requiring hand labor. We will export more products in which mechanization and power combined with the abundance of particular resources enables us to outsell most other regions.

The shorter-run outlook brings into purview the current and impending agriculture surplus situation. I shall insist on only one point, namely, that this country cannot keep on selling its surpluses abroad at prices much below domestic support levels without a growing deterioration of its trade relations with other exporting countries, with consequences increasingly serious each succeeding year. Commodity grants and loans in aid of development projects in poor countries need to be joint with these other exporting countries so far as possible.

The pattern of the future for income per capita is likely to follow closely, subject to the same qualification, that for population. We can expect a slowing down of the rate of increase beginning soon after 1975, and an acceleration of this slowing down after 2000. Probably I need at this point to make sure that none of you understand me to be saying that either population or income per capita will decline at these points in time. All I am saying is that the *rates of increase* will begin declining. Some of you who are familiar with Dr. Joseph Davis's pronouncements on these subjects, particularly in a paper on "The Economic Potentials of the United States" at the last Columbia University Bi-Centennial Conference, may think that I am differing from him. I am not. His statements are all in terms only of continuing absolute growth. Mine are in terms of declining rates of growth beginning to appear after 1975 and the accelerating of these rates of decline after 2000.

Along with this decline in the rate of increase in per capita income, the share of this income that will be paid for from products as they leave the farm or arrive in port can be expected to decline, but not indefinitely.

But when will this effect begin to appear? The Paley Commission report of 1952 estimated that technology then known if generally applied could increase agricultural output by 86 per cent without increasing the



acreage cropped. It balanced against this a rise of 10 per cent in the index of per-capita food consumption multiplied into a 28 per cent increase in population, making a total increased demand of 41 per cent, 38 per cent for all farm products combined. Using the revised population projection would raise this to 52 per cent. This would still leave a wide gap between demand and the potential 86 per cent. And none of you needs to be told that new potential is being added each year, and that the application of new farm technology is keeping pace with this potential. But how long will this continue?

Analysis under way jointly between myself and James Bonnen of Michigan State University, the results of which are scheduled to be published by the National Planning Association, indicates that, except for major catastrophies like world wars, or the two drought years in the 1930's, supplies of farm products will scarcely be in balance with market demand by 1970 or 1975. Perhaps our people can then look forward to a couple of happy decades when the equivalent of free-market prices induces just about that amount of expansion of output that markets will absorb at no advance in the general level of farm product prices. There will, of course, be ups and downs during these two decades, and probably differential trends for individual farm products, but no general trend upward or downward. After that, the most reasonable expectation is that prices of farm products will begin to rise relatively, very slowly at first, more gradually. Heavier pressure of population on the land in other countries than in our own may well be a factor in this. At this point the farm share of the consumer dollar will begin to slacken its decline.

As for the share of consumer income spent at retail for goods of agricultural origin, the Paley Commission report projected a decline from 26 per cent in 1950 to 20 per cent in 1975.<sup>2</sup> I would revise this 20 per cent to around 23 if I were making the analysis now. But the addition of distribution services and preparation for consumption surely cannot continue indefinitely at the rate of the past ten years.

Included in the balancing of population growth and technological advance in the three preceding paragraphs is allowance for the technology of increased industrial use of agricultural products and related changes named earlier. Research basic to such developments usually produces its results rather slowly. Its contribution to a better balancing of demand and output will largely come after 1975. Cost-price relationships and growing scarcities play a large role in the actual innovations following such research.

Potentially more important than the foregoing in achieving the balance sought is a better adjustment of production to the market, and in

<sup>2</sup> *Resources for Freedom*, Vol. V, p. 64.

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turn of consumption to the economies of production. I do not need to explain to this group surely that this calls for a large revision of the present control and price-support programs. The artifices, although different in objective, that we have been using have not worked out too much better than those used in Russia.

### *Resource Needs in the Future*

We can now set about answering the question asked in the title of this paper—what resources is the nation's agriculture going to need in the short run of 1975, and beyond then to 2000 and after? This will be done under several headings, namely, land and water, capital goods, operating units, labor and management both numbers and quality, scientific, and governmental.<sup>3</sup>

A. *Land and Water.* The total cropland used for crops in 1950-55 was identical with that used in 1928-30. The cropland harvested was 16 million acres less, in spite of the fact that total agricultural output was 46 per cent larger and 54 per cent larger in 1955. The 380 million acres of cropland reported as used for crops in the 1954 Census does not include 66 million acres of cropland used for pasture and 19 million other acres in cover and soil-building crops and the like, making a total of 465 millions of now available cropland.

The projection analysis that most nearly parallels what I am attempting is that of Barton and Rogers in *Farm Output . . .* in 1956. They project a needed increase of total farm output by 1975 of 34 per cent more than that of 1950-53. This 34 per cent is 45 per cent for livestock and products and 25 per cent for crops. This is considerably less than the 52 per cent named in the last section, but part of the difference is due to a lower population assumption. Barton and Rogers then calculate that the needed increase in crop output could be met solely by an increase of 28 per cent in crop yields per acre; or by a parallel increase in crop acreage. Wooten and Anderson in their 1955 report predicate an increase of 30 million acres of cropland or 6 per cent, part of this to come from converting permanent pasture into cropland. Nowhere in

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<sup>3</sup> Most aspects of this have been reviewed in four publications of the Production Economics Research Branch of the U. S. Department of Agriculture as follows: *Agricultural Land Resources, with Special Reference to Present and Potential Cropland and Pasture*, 1955, by Hugh H. Wooten and James R. Anderson; *Changes in Farm Production and Efficiency*, 1956, *Farm Output, Past Changes and Projected Needs*, 1956, by Glen T. Barton and Robert O. Rogers; and *Major Uses of Land in the U. S., Summary for 1954, 1957*, by Hugh H. Wooten and James R. Anderson. All of these present historical background series. All except the second of these do some projecting. It will be impossible here to review this large volume of material, and it will be assumed that most of you are already familiar with it. If not, you should read these reports.

these analyses is there definite allowance for a more efficient conversion of feed and forage into meat and livestock products. Barton and Rogers do indicate that pasture output will need to be increased 35 per cent.

This raises the question of availability of more cropland. Of course, the 85 million acres in pasture, cover crops, etc., is readily at hand. The Soil Conservation Service's classification of all the land in the United States into eight capability classes provides much more complete information on the subject. This has been fitted to the 1950 Census in Table 8 in the 1957 Wooten-Anderson report. It shows 216 million acres now in grassland and woodland that could be used for cultivated crops, and 40 million acres now in crops that should not be mostly because it is too subject to erosion. On the other hand, 82 million Class IV land now in grassland and woods could be used in hay and pasture.

The conclusions reached in the Paley Commission report still seem to fit this situation, namely that no additional cropland will be needed before 1975 except for converting some pasture into cropland in rotation, but 80 million acres of cropland in pasture and permanent pasture land will need to be improved by reseeding, liming, and fertilization to provide the needed increase in grass and clover. Wooten and Anderson, in a paper, "Land Inventory and Land Requirements in the U. S.," before the Soil Conservation Society last October, projected a conversion of 20 to 30 million acres of permanent pasture to cropland-pasture rotation, and in addition about 10 million acres of woodland.

This does not mean that no new cropland will be developed. The plans for many too-small farm operating units in the Farm and Home Development Program will call for such an adjustment as a way of enlarging them. Even with surpluses haunting us, the pressure is strong for more irrigation and drainage. But crop and livestock yields must be held in line to compensate for this or surpluses will continue to haunt us until 1975 or even after.

After 1975, the 216 million acres of Classes I-III land now in pasture and woodland will gradually be improved for cropping wherever this adds to output more economically than does increasing yields per acre and per head of livestock. At the same time, some of the Class III and Class IV and land now in woodland will become pasture land, especially in long rotations with crops.

Water for use in irrigation will continue to be scarce on the land that needs it most, unless some miracle of discovery intervenes. But in the Midwest, South and East, supplementary irrigation will be one of the ways of intensifying production, especially of milk and other supplies for local markets, as population pressure becomes more evident. The more well-to-do farmers with more productive dairy herds, and the like, will adopt it increasingly in the next fifteen years, before the ordinary

farmers can afford the luxury of it, and it will later spread to many of the more ordinary farms.

**B. Operating Units.** These are not a resource in the ordinary sense of a natural resource. They represent a combination of natural resources and the human resource of capacity to combine natural resources with capital goods, labor, and management into organization units that yield a certain ratio of outputs to inputs and net returns. The number of farm operating units declined 600,000 between 1950 and 1954. A continuation of this rate would give us only 2½ million farms in 1975. In my paper before the American Economic Association in 1955, I projected 3.8 to 4.0 million. I should now guess a decline to the lower limit of this range if not more, say to 3.6. Of the 600,000 decline in number of farms in 1950-54, two-thirds was in so-called commercial farms producing less than \$2500's worth of products, and the other third was in part-time and residential farms. We can expect this type of change to continue among commercial farms, not only with the under-\$2500 group, but up to \$5000-\$8000, although less so at the higher limits. The net effect of this will be a large gain in organizational resources used in agriculture. This growth will continue after 1975, but will slacken markedly when the point is reached where farm entrepreneurs are making as good return as their nearest counterparts, the independent store and shop keepers and smaller businessmen in adjacent cities. This point may well be reached by 1980-1990.

The principal retarding factors in this change will be the older farmers who tend to finish out their years on inadequate farms, and the low-grade types of farmers with little real ambition to improve their living, the counterpart of the slum dwellers in cities. The present system of small acreage plus marketing tobacco and cotton quotas for such farmers is well designed to keep up their numbers.

The numbers of part-time and residential farmers will decline less than of commercial farmers, partly for the reasons just mentioned, but partly also for the reason indicated earlier, a desire to live in the country on a piece of land.

My best conjecture is that the projected 3.6 million Census farms in 1975 will consist of 2.4 million commercial farms compared with 3.3 in 1954, and 1.0 other farms compared with 1.5 in 1954.

Two contrary influences on intensity of land use will operate in this shift toward larger operating units. On the one hand, the farms that acquire more land will tend to change to uses of it that lend themselves to mechanization; on the other, the smaller of the farms will tend to improve more of the land in their farms and raise it to a higher order of use. The latter will be a major factor in keeping up the pressure of supplies in the market.



**C. Capital Goods.** Under this head is included all of the resources used in farm production except the labor and management and nature's contribution to land productivity. Land improvements of all kinds are really capital goods. Contrary to common opinion on the subject, the average person working in agriculture today is working with far more fixed capital goods plus land than the average nonfarm worker—2.6 times as much in 1955. Much of this increase has come since 1940—the ratio then was 1.3. This has come about largely as a result of increased mechanization, but shifting to more livestock has also been a factor. These comparisons do not include supplies like fertilizers, purchased feeds, fuel oils, sprays, and the like, ordinarily called circulating capital goods in economics, which have increased even more; but so have their counterparts in industry and trade. The investment in capital goods in agriculture will surely keep on growing, in spite of the cost-price squeeze. It will grow most in periods when farms are enlarging the most and when market outlets are freest of surpluses. No attempt will be made to quantify this growth other than to say that no more than the 45 per cent increase in livestock output by 1975 projected by Barton and Rogers, with the increasing mechanization of the care of livestock sure to come, will mean a large additional investment.

**D. Labor and Management.** Gladys Bowles of the Agricultural Marketing Service and Conrad Tauber of the Bureau of the Census have calculated that 40 per cent of the young men now reaching working age in agriculture are not needed even to keep up the present numbers.<sup>4</sup> The number employed on farms declined nearly one-fourth between 1940 and 1954. Thus there must have been a tremendous movement out of farm employment. Will this movement overreach itself? All of you are familiar with Colin Clark's prediction that this country will be importing half its food supply in 1975 because so many will have left agriculture.<sup>5</sup> My projection in December 1955 was 1.25 to 1.30 workers per farm mainly employed in farming, to use the Census Bureau's definition. This times 3.6 million farms would mean 4.6 millions on the farm labor force in 1975. The USDA definition includes about 30 per cent additional who work both on and off the farm but not mainly in agriculture. Including these would raise the projected 1975 farm labor force to around 6 million in 1975.

If the projected 1.0 million part-time and residential farms employ only 400,000 workers mainly at farm work, this would leave an average of 1.75 workers per commercial farm, of which something a little under 1.0 would be proprietor labor, and not much more than 0.3 hired labor.

<sup>4</sup> *Series Census*, AMS (p. 27), No. 22.

<sup>5</sup> Clark has indicated in a letter since that his statement was conditional on an assumed continuation of the migration rates of around 1950.

Obviously there is no lack of potential numbers of workers in agriculture. The main questions are these: (1) Will the prices of farm products be high enough to keep enough in agriculture? My answer is "Yes, after 1975." Between now and then, more than enough will be kept in the low-income areas, but scarcely enough hired labor in better farming areas with growing industries in their midst. This will stimulate further mechanization and more consolidation of farms in these areas and a shifting to more extensive types of land use. Of course there will be loud calls about labor shortages in tobacco farming and similar areas, but this will be because they are persisting in a hand-labor type of farming that will be increasingly unable to compete in this country, or will require relatively higher prices for its products. The prices will rise as supply declines, but only enough in most cases to employ part of the former labor force. (2) Will the quality of the management and labor improve as needed? My answer is, "Again not enough in the congested and lower-income farming areas, unless a much strengthened program of farm planning and other extension service education can be provided in these areas and the emphasis in this planning and education can be shifted toward promoting acreage and other enlargement of farms." Not only the quality but the character of the management needs to be changed. In the better farming areas, it is almost wholly the character of the management that will need extra attention—the character needing attention being ability to think better in terms of adjustment to the market rather than of larger output. As more farms enlarge, the farmer's sons will be able to get the kind of youth experience they need on their home or neighboring farms.

*E. Scientific.* The continuation of the present program of agricultural research at the land-grant experiment stations and in the USDA and its branch stations, will, in my judgment, provide all the scientific foundation that is needed to enable agriculture to meet expanding demands, except for one important aspect of it, namely, readjustment of production programming to changing technology and to the changing market. The research now under way is directed mainly toward getting larger yields per acre or per animal unit; secondarily toward larger outputs per unit of some input factor, such as feed or fertilizer, or man-hours of labor. The results of future research along these lines are going to be very important to our country after 1975. But from now on, the young men coming out of our agricultural colleges must be prepared also to analyze their farms as operating business units. Much production economics and other economic research is going to be needed to provide the information and understanding required for this. Also an increasing number of extension workers must be equipped to provide the present generation of farmers with this information and help them apply it to their farms.



F. *Governmental*. Finally, the present federal governmental programs, to help agriculture by means of price supports and production adjustments are either still undeveloped or crude. If programs of this type are to be helpful, they must fit the different products and the different types of situations from period to period and year to year. Even if the decisions to achieve this fitting are left to administrative agencies, there must be a clear understanding of the relationships involved and quantitative expression of them insofar as possible. If Congress is not willing to leave such decisions largely to administrative agencies or boards, it must provide in its legislation a set of guides or directives that will provide the needed fitting. The directives in present legislation are for the most part severe handicaps to the needed fitting.

### DISCUSSION: RESOURCES NEEDED IN AMERICAN AGRICULTURE

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The survey on the resource needs of American agriculture, Professor Black has presented impresses me as a cautious appraisal that is in line with the thoughts of the majority of agricultural economists concerned with this sort of general outlook. It seems significant for the way in which the proposition of looking into the future has been dealt with by economists throughout the world during the last four decades, that nowhere in this paper is there any hint at a possibility of forecasting with certainty or accuracy in the short or long run. Furthermore, nowhere in his paper is there any hint at the operation of a business cycle that moves with the regularity of the ocean tides. Instead, there is a reserved optimism as to the future expansion of the American and the world economy. Furthermore, there is no strong faith even in the inevitability of the continuation of trends.

With all of this I can heartily agree, as I can with the advise to make various short-run projections and to set up models in spite of the utter uncertainty of projections of population.

This leaves much leeway, still, for differing on many of Professor Black's observations which cover large and important areas in his survey. He puts much emphasis on the limitation of natural resources measured by a supposed long-run need of geometric increase in yield caused by an assumed sustained geometrical population growth. He anticipates greatest scarcity first of some minerals and fuels, then of water, and then of land. As to the first category, I believe that in the rare mineral field enough flexibility exists to cope with relative scarcity, and that no short-

age of fuel or—better—energy is in sight for a very long stretch of decades. If we eliminate atomic energy as a potential, of which no proof exists that it can economically compete with other sources of energy, then our known bituminous-coal, lignite, oil, oil-shale, and gas resources are so enormous that even hydroelectric power is being pushed into the background except for some preferred waterheads and multiple-purpose by-product hydro-energy. If oil runs short, oil shale will be used. If natural gas should run low, lignite as well as coal will be cracked at the mines and the gas fed into pipe lines.

With reference to water, I do not know what Professor Black's views are, but it seems to me quite improbable that a real shortage of water resources will become a pressing problem. Agriculture by necessity has its most economical geographical location for the bulk of its output in humid climates with an excess of water—that is, east of the 100th meridian. In the arid and semiarid sunshine climates the utilization of water resources calls for more investment than does drainage in the humid climates. Hence in the fields of energy and of water resources the real scarcity refers to investment capital rather than to natural resources.

When it comes to land, it can be demonstrated that the nonagricultural land uses will eat so deeply into the supply of land that long before agriculture becomes really pinched by its own demands, some economy will become necessary in utilizing land by a strongly growing population. I cannot see for, say, a century at least, any real shortage of land for agricultural production.

With reference to population growth, I should like to voice some doubts about some observations Professor Black has made. I agree with what he says about the impact of higher levels of living and education on a slowing-down of population growth. What seems very questionable is his conviction that a lack of knowledge of the means of controlling family size is one of the underpinnings of rapid population growth. It is a well-known fact that wherever people have had the urgent desire to control family size—that is, when the values in their society made that result important—they have always found the means to do so. This held for the Romans in antiquity, for the Jews, for the Japanese in the 18th and early 19th centuries, and even for many aboriginal tribes in distant corners of the world. This seems important, because the change in values, mores, and institutions is a much more difficult and slow process—as our desegregation difficulties demonstrate.

I have considerable doubt also on the assertion that "perhaps 40 per cent of the world's population is living under Malthusian conditions with virtually no rise in the levels of living." This refers, I suppose, primarily to the population of large parts of Asia and Malaysia. But, according to Malthus, population growth would cease under such circumstances, while

in other parts of the world it would continue. The population statistics for India seem to undermine such an assumption. It is the great contradiction that for almost two centuries the population of India has supposedly lived on the Malthusian level, and that no increase in food production was possible—and yet the population has grown fabulously and continues to do so. That poverty exists on an appalling scale does not prove that the production of food cannot keep pace with the increase in population, while at the same time profound changes in mores and institutions are also in the making.

On all that Black has said about land and water operating units and capital goods I find myself in agreement, particularly as to the impact of supplementary irrigation on production. I would add, though, that the profitability of using more nitrogen at relatively declining prices forces the use of more water. One of the most revolutionary innovations in plant production is the general introduction of sprinkler irrigation. It amounts to a vast enlargement of productive acreage, because it does not require level land or high-grade or deep soils. It can be applied on slopes without working the soil, as check-dam irrigation by flooding does, and the simultaneous application of nitrogen in the form of anhydrous ammonia requires no work either. The sudden general introduction of sprinkler irrigation results from more than 50 years of innumerable small inventions for pipe-couplings and sprinkler heads, pumps and engines, and most of all from the drastic lowering of prices and improvement in quality of aluminum—an industry in which virtually one corporation has a near-monopoly. This new irrigation is spreading like wildfire over all the states—to the extent that no longer do we have any reliable statistical data on the acreage under irrigation.

Professor Black points to the prospect of further growth of investment in capital goods in agriculture "in spite of the cost-price squeeze." It would seem more like close reasoning to say "because of the cost-price squeeze." The chief method of escaping this squeeze is the use of more capital goods per man.

Colin Clark's prediction is nothing but an illustration of everyone's freedom to arrive at nonsensical results in the rather corny game of trenditis. I also share Professor Black's confidence in the maintenance of an equilibrium between the nation's food needs and the manpower needs of agriculture to supply them via the mechanism of prices of farm products. But I see no reason to modify this by postponing such balance until after 1975.

In appraising the scientific resources for agriculture, I sense that I have perhaps an entirely different picture of what these resources are today and have been in the past than has Professor Black. But possibly this only seems so. He sees—or at least speaks exclusively of—the land-

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grant experiment stations and the United States Department of Agriculture and its branch stations, and expects them to "provide all the scientific foundation" agriculture needs to meet expanding demands. With all due respect for and genuine appreciation of the vast amount of work that is done in these public institutions, I venture to say that they are only a part of the national research resources that serve our agriculture, and that, measured in terms of scientific discovery, innovation, creative thought, and applicable knowledge, it is even possible that they are its smaller part.

I refer to the strategic fact that scientific research, particularly in chemistry and physics, in electronics, metallurgy, medicine, pharmaceuticals, nutrition, engineering, genetics, and a multitude of other areas, is being carried out in this country by private corporations—either in their own research institutes and laboratories or by specialized contracting research enterprises. Research scholars are not located exclusively in state-supported universities and colleges, but are to be found in privately endowed institutions and foundations as well. Irrespective of whether it concerns fertilizer, feed, or seed, machinery, implements, or sprinkler-irrigation equipment, veterinary medicines or pesticides, or processes for better food and fiber products, private initiative is, beyond question to me, the Number One propelling force. I believe that Henry Wallace's U. S. Regional Laboratories have turned out to be chiefly a subsidy to private industries for training personnel from which they can pick the most promising talent.

A most worthy undertaking for someone in our profession would be to make a survey of all the known research and all the rapidly increasing services to agriculture carried on in privately financed and operated agencies. One of the fields of study close to agricultural economics, which holds the promise of opening new vistas to our profession, is chemical economics. This is most worthy of attention, and is an area in which the competent scholars work almost exclusively for private research organizations. I am also of the opinion that with the shrinking number of farm managers of rapidly rising competence and education, and with the increasing private services offered to farmers, the agricultural extension services in many states face the serious problem of how to remain in demand and how to keep a few yards ahead of the farmer. In a society that remunerates service primarily in dollar income, it is a real problem to keep high-caliber technical advisers in positions that will yield incomes that in many instances are only a fraction of what their clients are actually earning, with or without advice.

Aside from these minor supplementary observations, I want to congratulate Professor Black on a well-balanced and realistic outlook into the future.



## GUIDING AGRICULTURAL ADJUSTMENTS\*

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### *I. The Recent Renewal of Concern About Agricultural Adjustment*

THE past two years have witnessed a striking renewal of interest among agricultural economists in the problems of agricultural adjustment. In the 1920's political attention was largely focused on the possibility of transferring our farm income problem to the export market. In the 1930's official emphasis was placed mainly on acreage restriction as a means for reducing supplies of farm products and raising prices. During World War II farm leaders succeeded in establishing the 90 percent of parity line, setting the stage for postwar arguments over flexible versus rigid price supports.

During Clinton Anderson's tenure as Secretary of Agriculture (1945-48), modernized parity and flexible price supports—"flexible both in level and in method"—became major elements of the official USDA position. This position was embodied in the so-called "permanent" provisions of the Agricultural Act of 1948—which were postponed in 1948, revised upward in 1949, and postponed repeatedly during 1950-54. The sharp change in the USDA position under Secretary Brannan put government in the unusual position of offering farmers higher price supports than were requested by the leading farm organization and gave partisan political backing to the 90-percent (and even 100-percent) line.

The postwar adjustment in farm prices and incomes which began in 1948 was interrupted by the outbreak of hostilities in Korea. Farm land values declined a little in 1949 and purchases of farm machinery hesitated in early 1950 as though farmers had for the most part achieved adequate stocks of machinery relative to their income expectations and production plans. But, with Korea, land values rose another 25 percent from mid-1950 to mid-1952 and farmers made large precautionary purchases of farm machinery, while USDA and the land grant colleges gave renewed emphasis to means of maximizing farm output. When the new farm price inflation subsided in 1952-53, farmers owned nearly twice as much machinery and were using 50 percent more fertilizer than in 1948 at the beginning of the first postwar readjustment.

It is not surprising that the first Republican Secretary of Agriculture in twenty years should have looked askance at the programs inaugurated

\* Journal Paper No. J-3263 of the Iowa Agricultural and Home Economics Experiment Station, Ames, Iowa, Project No. 1354. I am indebted to Donald R. Kaldor and Carl C. Malone for helpful comments on an earlier draft of this paper.

under a Democratic regime. The outgoing administration had refrained from announcing marketing quotas and acreage allotments for 1953 crops; for all practical purposes, this meant that Secretary Benson inherited about 900 million bushels each of wheat and corn and nearly 10 million bales of cotton before his own decisions or compromises had a chance to influence developments.<sup>1</sup> Although one might argue that a "crash" program of minimum acreage allotments might still have been applied to the 1953 crops of cotton, corn, and spring wheat, Congress might very well have passed special measures to increase these minimum allotments as it subsequently did with respect to the crops of 1954.

It seems clear from his early public statements that Mr. Benson would have preferred the Agricultural Act of 1948 (that is, its permanent provisions) to the set of measures finally proposed as "the President's farm program" in January 1954. This program was actually less flexible than the Agricultural Act of 1949 and represented a major concession to the proponents of rigid supports at 90 percent of parity. As one observer put it, the path of Congressional decision in 1954 lay somewhere between 85 and 90 percent of parity. The Administration made a short step in the direction of flexible price supports, and the length of this step was greatly exaggerated by both parties.

Since 1954 the experience with diverted acres and with increased yields of quota crops has forced a reappraisal of the farm problem and of the means for dealing with it. Ten-cent hogs in the winter of 1955-56 convinced some Iowa farm leaders that fundamental changes were needed in existing farm programs and in the emphasis of land grant college research. In early 1956 the Iowa Agricultural Extension Service began to focus attention on the problem of agricultural adjustment, with new staff and leader training activities, district farm policy forums, and the 1956 annual extension conference all directed toward this end. At the same time, the North Central Farm Management Research Committee, in cooperation with the Farm Foundation, was organizing a conference on "Adjusting Commercial Agriculture to Economic Growth"; this conference was held in March 1957. During January-April 1957 the Division of Agriculture at Iowa State College held weekly seminars on substantially the same subject, and an Agricultural Adjustment Center was instituted there on July 1. The Joint Economic Committee of Congress is planning extensive studies and hearings on commercial agriculture during the months immediately ahead. The last three of these activities will lead to printed publications within the next three or four months, and economists will soon have an opportunity to determine for them-

<sup>1</sup>These figures represent total United States carryovers at the end of the respective 1953 crop years—CCC stocks and loans were somewhat smaller.



selves the degree of consensus as to what the farm problem is and what should be done about it.

## II. Nature and Magnitude of the Agricultural Adjustment Problem

As an industry, agriculture is out of balance now in the sense that returns to human effort in farming are considerably below those in other sectors of the economy. If price supports and special export programs were suddenly discarded, returns to human effort in agriculture would fall still lower.<sup>2</sup>

This disparity of returns might conceivably be removed in the short run by transfer payments to farmers or by very high price supports coupled with stringent production controls. Over the longer run, the orthodox solution requires a transfer of labor out of agriculture until the marginal value product of the labor remaining becomes equal to that of similar labor applied in other economic sectors. Compared with the current situation, this long-run adjustment would probably involve a moderate increase in the parity ratio and a sharp decrease in the number of full-time equivalent farm workers.

The needed adjustment of farm output to demand is suggested by the following figures:

From 1950 to 1956, farm output increased at the rate of 2 percent a year. However, requirements for 1960, four years farther up the road, are estimated at only 1 percent higher than the actual production of 1956.<sup>3</sup> Even if we had no excess stocks on hand, the implication is that farm output should stand still and mark time for at least four years. When we allow for the fact that in 1956 we had excess stocks—over and above reasonable reserves against weather and other hazards—equivalent to about 15 percent of a year's production, we would have to reduce production in the years 1957, 1958 and 1959 by at least 5 percent below the 1956 level if we expected to get "back in step" as of 1960. Such an effect was obtained only once before in our history, by the great drouths of 1934 and 1936 coupled with emergency acreage reduction programs.

Actually, we cannot expect crop yields and livestock feeding efficiency to remain constant nor can we assume that the Soil Bank will cut total output by 5 percent. The prospect is that there will be considerable slack in our farm economy for at least a decade, and that pressure for extensive government intervention in agriculture will continue indefinitely.

<sup>2</sup> This still assumes that existing CCC stocks would be withheld from the market.

<sup>3</sup> These requirements implicitly assume a parity ratio of 92 percent, as in 1953. See Rex F. Daly, "The Long-Run Demand for Farm Products," *Agricultural Economics Research*, July 1956.

The foregoing paragraphs deal with agriculture as an industry in which farmers and others are interested only as a source of income. But people also attach nonmonetary values to farming as a way of life with freedom from personal supervision and opportunity for close family and neighborhood ties. When labor is withdrawn from a farming area, community services and institutions are also affected and the nonmonetary values associated with farming *may* be impaired.

Finally, agriculture has a different geographic distribution than that of other economic activities and there are striking regional differences in farm labor productivity and income. These differences reflect whole complexes of past history and present attitudes, involving educational levels, race relations, standards of living, values placed upon leisure, and other elements. This means that agricultural adjustment problems are closely intertwined with those of regional economic development and that the extent of agricultural maladjustment cannot be properly summarized by a comparison of average incomes of farm and nonfarm people at the national level.

### III. Prospects for Transferring the Agricultural Adjustment Problem

A few years ago there was a saying current in Washington that a major problem could be handled in three ways—it could be “discussed, postponed, or transferred.” Farm problems in the last decade have certainly been discussed and postponed—these are programs of inaction. But transference is a program of action, and various methods of transferring part of the adjustment problem have also been zealously pursued.

Quantitatively, the most important attempt at transfer has occurred via export subsidies, sales for foreign currency, and gifts to foreign countries for famine relief. The Agricultural Trade Development and Assistance Act of 1954 (Public Law 480) has obligated some 3 billion dollars of United States funds and has been instrumental in increasing our exports of farm products above the readjustment level of 1952-53. Substantial subsidies have been paid on wheat exports since 1949 and on cotton exports since 1956. During 1955-56 some 40 percent of our farm exports were government financed. Without these programs and the direct export subsidies, but with continued price supports, it seems likely that exports in the last year or two would have been a third to a half lower, a reduction equivalent to 3 or 4 percent of total farm output. As to prospects for continuance of large farm exports, I can only cite the Rex Daly projection which shows a 1960 export volume about the same as that of 1952-53 and well below that of 1955-56.

Several public and private efforts have been made or proposed to ex-

pand domestic consumption of food. The school lunch and school milk programs have doubtless had both current and long-run effects on food consumption. But the current effects are equivalent to small fractions of 1 percent of farm output. Industry efforts have been made to promote consumption of all types of livestock products. Few attempts have been made to evaluate the effects of such programs. When allowance is made for the normal effects of changes in retail prices and consumer income, there is no clearcut evidence at the national level that promotion has increased the consumption of livestock products either individually or as a group. There are theoretical bases for expecting that increases in product variety will expand consumption of a class of products at least slightly; certainly there is evidence that new products, such as commercial broilers, have displaced old ones, such as farm chickens—partly through quality and merchandising and partly through efficiencies in broiler production. But these developments have to a large extent transferred problems from one farm product to another; the net transfer from agriculture to other sectors (i.e., the increase in consumer income going to farmers rather than to nonfarm producers) must so far have been quite small.

At most, promotion and quality improvement will somewhat accelerate the shift from lower cost to higher cost calories that appears in long-term food consumption trends and in cross-section relationships between family income and food consumption. Nutritional education focused on the same goals will tend to have similar effects. But with a sharp increase in per capita consumption of livestock products since 1950 nutritional deficiencies in this area must have been greatly reduced. And it is not a foregone conclusion that all future nutritional research will yield the answer "eat more meat."

During the past 3 or 4 years there has been some direct distribution of surplus foods to needy families. But the limited number and dispersed residence of needy persons and the limited range of commodities in CCC ownership have limited the gross volume of this program to a fraction of 1 percent of farm output. The substitution of free flour, corn meal and beans for the store purchases otherwise made by needy persons must reduce the *net* effect of relief distribution to a fraction of the gross amount so distributed.

The most ambitious program proposed (but not adopted) for expanding food consumption domestically is Senator Aiken's Food Allotment Plan. The maximum potential of such a plan appears to be a consumption increase equivalent to 2 percent of total farm output. More realistic allowances for nonparticipation, geographic coverage, and diversion of some Food Allotment purchasing power into nonfood items would reduce the probable expansion to less than 1 percent of farm output if such a plan were adopted.

The present farm income and surplus problem exists despite vigorous exploitation of all the special export and domestic consumption programs mentioned above *except* the Food Allotment Plan. In the last few months emphasis has shifted to industrial utilization as the major remaining opportunity. Doubtless much good will be accomplished by increased utilization research. But any program based on new research and on an expansion in the number of young Ph.D.'s will involve major time lags before quantitatively important results can be expected. The experience under the Research and Marketing Act certainly illustrates this point. Furthermore, the industrial utilization program with the biggest theoretical potential—the use of industrial alcohol for motor fuel—is definitely not recommended by the Commission on Increased Industrial use of Agricultural Products. On this point the Commission says “it appears clear that the cost to the public would far outweigh the possible advantages.”<sup>4</sup> With the help of “economic incentives,” however, some other sizeable outlets might be found for corn priced at 11 cents to 50 cents per bushel.<sup>5</sup>

Although many new self-supporting products may be developed as a result of this approach it seems unlikely to me that such products will absorb more than 1 percent of total farm output annually over the next decade. The oft-cited expansion of a new crop, namely soybeans, occurred largely at the expense of reduced imports of vegetable oils from other countries, and its chief product proved highly competitive with butter. Quite a number of the new uses to be investigated would ultimately involve price competition with petroleum products or byproducts—which looks to me like an uphill battle all the way.

Marketing research should of course be added to the array of methods for transferring the agricultural adjustment problem to other sectors of the economy. Increased efficiency in marketing would tend to increase consumption and/or prices of farm products. It seems safe to say that farmers as well as consumers have benefited from marketing research despite substantial declines in the farmers' share of the consumers' food dollar. In this case as well as in that of utilization research, it is unrealistic to expect gains of 10 percent in farm income from programs involving expenditures of less than a hundredth of that amount. Most of the benefits from both types of research are likely to accrue to consumers, including farm people in their consumer role, over the long run.

The phrase “transferring the agricultural adjustment problem” may suggest a more negative attitude toward the aforementioned programs than I wish to convey. In a sense, all economic competition may be

<sup>4</sup> *Report to the Congress from the Commission on Increased Industrial Use of Agricultural Products*, Senate Document No. 45, 85th Congress, 1st Session, page 90.

<sup>5</sup> *Ibid.*, p. 96.



regarded as an attempt to transfer unpleasant adjustments to other firms and industries, and I see nothing immoral in farmers attempting to do the same thing with or without government help. My use of the phrase does imply a judgment (1) that only a fraction of the agricultural adjustment can be *successfully* transferred and (2) that preoccupation with special programs to expand utilization and exports diverts attention from more important adjustment activities. The existing emphasis is appropriate only if it is felt that the more basic adjustments will take place automatically (or cannot be purposefully hastened) and that they will be less painful if the attention of the adjustees is diverted to other things.

#### IV. Models for Appraising the Degree and Rate of Agricultural Adjustment

A. "*Final*" equilibrium. Economic theory offers us one norm appropriate to a spaceless, frictionless, static, and perfectly competitive economy. In such an economy, the marginal products of equivalent units of labor and capital would be the same in all industries; each unit of labor and capital would find its most productive employment, and real income for the economy (in terms of consumer satisfactions) would be maximized subject to the initial distribution of ownership of productive agents. Although economists frequently discuss the problem of balance or adjustment in terms stemming from this model, it is difficult to find statistical data with which to measure departures from it or rates of approach to it.

If we recognize the geographical extent of the United States and the economic (let alone the social) costs of migration, we should expect geographic differences in the marginal value products of labor to persist indefinitely. So long as net migration between two points is required to maximize the total income of the society such differentials would be expected. Over a century or so, new locational factors might cause a reversal in the direction of net migration, so that an income differential at the margin would continue to exist but its sign would be reversed. Migration between any two points would tend to generate different age distributions, different relations between average and marginal labor incomes, and different relations between income *per person* and income *per worker* than if no migration had occurred. The shifts in total population and its internal distribution at each point would also change the locational advantages of different economic activities.

In effect this leads us to a spatial equilibrium model for labor or, more generally, for human population and migration. A complete economic system would also involve a spatial equilibrium model for capital, and similar models for each good and service—"final" equilibrium in-

volving an optimum intermeshing of these for all goods and production factors. Optimum adjustments for the economy would, of course, involve movements of capital and jobs to people as well as of people to capital and jobs.

B. *Rate of progress toward equilibrium.* In the immediate vicinity of a metropolitan center one would expect real incomes of farm workers to approximate closely the real incomes of city workers of comparable ability and training. I observed an unusually clearcut case of this in California during World War II. There was a very close association between net accessions of workers to the shipbuilding and aircraft industries and the rate of increase in wage rates of hired farm labor from quarter to quarter. The increase in farm wage rates was extremely rapid in 1942 and less rapid in 1943. As of early 1944, farm wage rates in Southern California appeared to be leveling off toward an asymptote a few cents per hour below the widely advertised entering wage in the aircraft industry. In Northern California farm wage rates appeared to be approaching a similar asymptote a little below the entering wage at the shipyards.

This situation is a simple one and approaches the "final equilibrium" norm of nearly equal labor incomes. But how shall we appraise the rate of adjustment in larger regions, or in regions in which the farm labor force is large relative to the increase in nonfarm job opportunities? Bellerby points to experience in Quebec in which "incentive incomes" of farm operators averaged only a third as large as those of nonfarm workers in the same province.<sup>6</sup> In advanced industrial countries prior to 1939, after valuing family consumption of farm food products at retail prices and making other adjustments, Bellerby found the incentive incomes of farm people to average about 55 percent of those for nonfarm workers. Of the disparity of 45 percent, he states that, "if acting independently, in the conditions before 1939" occupational immobility of farmers together with movement of nonfarm people into agriculture "would probably have been capable of producing a disparity of 30-35 percent of the nonfarm average incentive income in most countries." Psychic attractions and cheapness of living were "almost as powerful . . . in the Netherlands, Quebec and Ireland, but, in general, (they) probably could not independently account for a disparity of more than 20 percent." Bellerby gives relatively little weight to "social immobility" and "personal immobility and inertia" in most of the industrial countries.<sup>7</sup> However, they are important in some regions of the United States.

<sup>6</sup> J. R. Bellerby, *Agriculture and Industry Relative Income*, London: Macmillan and Co., Ltd., 1956.

<sup>7</sup> *Ibid.*, pp. 287-288.



For the world as a whole, Bellerby states that an average incentive income ratio of "75 percent is as high a figure as can reasonably be expected to emerge in the long-term future in conditions most favorable to agriculture."<sup>8</sup>

There is evidence that high employment in the national economy reduced the variability in per capita incomes among states by a third between 1940 and 1953. Farm operator level-of-living indexes showed only 58 percent as much variability among the states in 1954 as in 1940. The direction of these changes is in line with what one might reasonably expect in a high-employment economy. But large interstate differences remain, and the ratio of farm to nonfarm income per capita also varies from state to state.

Can we assume that continued high employment will reduce income disparities by another third in the next 13 or 14 years? Do we have criteria for deciding whether this rate of approach toward "equilibrium" is too slow? If so, do we have any basis for anticipating the quantitative effects of various programs designed to accelerate the approach? Can we set up reasonable objectives for farm incomes per worker by states and by regions for various future periods 5, 10, 20 or 30 years ahead? And what will be the relationship between *average* incomes of all farm people in different areas as compared with incomes of the younger, more mobile workers who may represent the *margin* at which incomes should ultimately be brought into equilibrium? Is there an optimum rate of migration out of a low-income farming area—i.e., can we measure the social costs and benefits of migration both to those leaving and those remaining well enough to estimate an optimum rate?

#### V. Nature of the Adjustments Required in Agriculture

The general nature of the required adjustments is well known to agricultural economists and is in line with historical trends: It seems clear that the next few years call for a transfer of considerable labor and perhaps some capital from farming into other occupations. The transfer of labor has been proceeding at a rather rapid pace for several years, with the number of persons working on farms declining by 30 percent since 1940. An increasing proportion of farm residents are reported as working primarily in nonfarm jobs, or as spending at least 100 days of the year in nonfarm work. The percentage of farm women who are members of the labor force has also been rising. These changes have obviously involved a large amount of migration of farm people, partic-

<sup>8</sup> *Ibid.*, p. 304.

ularly young people, from farms into other places of residence and other economic activities.

Advances in farm technology have permitted farm output to expand more rapidly than the demands for it. Innovators or early adopters of new techniques have had a strong profit incentive to do so. Other farmers have had to adopt the new techniques to avoid absolute as well as relative deterioration of their income status. Still others have failed to adjust their farming operations as such but have transferred part of their energies to nonfarm jobs. Large gains in output per acre and per animal can be obtained simply by wider adoption of known techniques, by applying fertilizer at economically optimum levels and by feeding better balanced rations. New techniques will doubtless continue to appear.

These changes in farm technology have provided consumers with abundant food at moderate prices and have released labor from farming to produce goods and services with more rapidly expanding demands. But the transfer of resources from agriculture has not been rapid enough to maintain farm income on either a total or per capita basis. At the same time, real incomes of nonfarm people have increased steadily and substantially. If farm people are to share in the fruits of technical progress and economic growth in the next decade or two, it appears that the rate of labor transfer from agriculture must be increased or the rate of technical advance in agriculture must be decreased. The latter alternative is usually rejected on the grounds (1) that it would violate American traditions, (2) that it would reduce the national income, and (3) that there are no feasible methods of achieving it. We are thus thrown back upon increased labor mobility as the principal means of adjusting agriculture to economic growth.

This line of adjustment requires fewer and larger commercial farms. The drive for larger farms is deeply rooted in the aspirations of farm operators as individuals responding to the opportunities and compulsions of modern farming techniques. For example, extension economists in Iowa held 9 meetings last winter in which groups of farm leaders were asked to give their views as to acreage and other requirements of an adequate family farm in their counties. Labor input per farm was to be held at the actual level of 1954—1.4 man years. At each meeting, covering widely separated parts of the state, the modal estimate of crop acreage required was about 60 percent larger than the actual average per commercial farm in their counties as of 1954.

A current study by Iowa economists gives some notion as to the nature of adjustments that lie ahead even in the more advanced agri-

cultural areas.<sup>9</sup> If trends of the past decade continue, farm employment in Iowa will decline from 281,000 in 1950 to about 214,000 in 1965—nearly a fourth. Farm acreage per worker would increase by nearly a third. If there were no net migration from Iowa farms between 1950 and 1965, in the latter year there would be a labor surplus of about 190,000 workers—a total of 404,000 farm workers available for the 214,000 farm jobs.

Trends in nonagricultural job opportunities also were projected to 1965 for each of 9 state economic areas. In 7 of these areas, natural increase in the nonfarm labor force would probably exceed the growth in nonfarm job opportunities. Thus, if recent trends continue, a majority of Iowa's 99 counties will face stability or moderate decreases in total employment between 1950 and 1965. It seems likely that whatever growth in nonfarm employment occurs in some parts of the state will be concentrated in a few of the larger towns. Small towns and villages in predominantly rural counties will typically have stable or declining populations, and some of their present economic activities will be absorbed by the county seat towns or in some cases, by "area capitals" dominating a block of several counties.

Although adjustment of individual farms to new techniques is the main driving force, modification of rural institutions is an extremely important part of the total adjustment process. In Iowa, for example, many schools are too small to provide an adequate range of subjects despite higher-than-average costs per pupil. Many churches are too small to support qualified ministers and adequate activity programs. Many creameries are too small for efficient operation; so are a considerable number of grain elevators. All of these institutions have made some response to economic pressure in recent years. During the 1956-57 fiscal year, about 9 percent of the 3,300 school districts in Iowa were consolidated into larger units, although some of the latter were still below the minimum size recommended by state educational officials. The number of creameries in Iowa has declined substantially since 1940. However, these and other predominantly rural institutions will undergo even greater changes in the decade or two ahead.

#### VI. Means for Facilitating Agricultural Adjustments

Most of the relevant methods for facilitating adjustment operate directly or indirectly to increase labor mobility. In most farming areas at least half of the boys growing up on farms must look forward to

<sup>9</sup> This study, sponsored by the Iowa State College Community Research Center, was made by Donald Kaldor, Ray Wakeley and Karl Fox of Iowa State College and Clifford Baumbach, Clark Bloom and Woody Thompson of the University of Iowa.

careers in the nonfarm economy. So-called "agribusiness" offers an outlet for some of these young men; however, I suspect that those parts of "agribusiness" in which a farm background is distinctly helpful will grow more slowly than the nonfarm economy as a whole.

It is highly important, therefore, that farm boys and girls receive educations that will enable them to compete on equal terms for nonfarm jobs. Leaders of youth programs that aim at character development through crop and livestock projects might well consider whether the same ends could be obtained by projects of a different nature. I know very little about the vocational agriculture program, but I subscribe to the idea that it should be oriented toward "training rural youth" rather than "training boys to farm."<sup>10</sup>

Some economists lay considerable stress on expanding employment services to inform farm people about nonfarm job opportunities. I am not sure just what procedures they have in mind and how effective they would be. It seems to me that farm people whose best opportunities seem (from the expert's standpoint) to lie outside of agriculture must somehow "get the feel" of what it would really be like to live and work in a town or city environment. How this is to be done I do not know, but I doubt that very much will be accomplished by mass media. (One exception might be television or radio interviews with people who have already moved from farms in the area to which the broadcast is being beamed.) Eldon Smith's findings are very much in accord with my expectations on this score—information from relatives and friends appeared to be many times as important as information from all formal media in encouraging worker migration.<sup>11</sup>

It is particularly important that rural boys and girls get some real feeling for other ways of life before they have to make major occupational decisions. Somehow they must get face-to-face acquaintance with these other patterns of living, or a near equivalent to it through television and radio programs of a down-to-earth character, educational films, vocational guidance counsellors, extension meetings, and other means.

Another need is the particularization of comparisons between farm and nonfarm job opportunities to local situations that farm youth and beginning farmers can really appreciate. Earl Heady has made a number of studies recently in which a wide range of alternatives, including part-time farming and complete transfer to nonfarm employment as well as on-the-farm adjustments, are programmed through for typical farms in

<sup>10</sup> See Raymond J. Penn, "Discussion: Status of the National Rural Development Program to Date," *Journal of Farm Economics*, May, 1957, p. 281.

<sup>11</sup> Eldon D. Smith, "Nonfarm Employment Information for Rural People," *Journal of Farm Economics*, August, 1956, p. 815.

different parts of Iowa. This sort of material could be extremely valuable in intensive work with young farm couples in the farm and home development program and with small groups of boys and girls of high school age.

More intensive educational work is needed on the problems of community and family adjustments to a declining number of farm jobs, and perhaps to a decline in the total jobs in given areas. Economists can point up some of these problems with information on basic farm income potentials and returns to scale under local farming conditions, on economies of scale in farm businesses such as creameries and grain elevators, on costs of education in schools of different sizes and so on. There is much work to be done by sociologists, some of it in cooperation with economists. One possibility is the organization of institutes of community services at some of the land grant colleges to mobilize the resources of sociologists, agricultural economists, industrial economists, town planners, and industrial engineers around the problems of particular communities, counties, or groups of counties. Many of these problems require a team approach.

There will, of course, be hazards to public relations in all programs that deal forthrightly with the problems of agricultural adjustment. Extension workers and directors must expect to get some angry letters from people whose hopes or beliefs are offended by presentations of basic facts on the agricultural situation. Farm people have been in a serious income squeeze for several years, however, and many are aware that some of the "transference programs" have not done much to improve the situation.

Time does not permit a detailed cataloging of the many facets of a "complete" agricultural adjustment program. Though some of the problems to be solved are national in scope, I suspect that the importance attached to the adjustment approach will vary widely among the different states. Among the facets omitted from this paper is the possibility of industrial development in rural areas. Although some opportunities exist, this is a subject about which there is a great deal of wishful thinking. More real research is needed on factors favoring location of industry in particular rural areas, and on objective appraisals of the various promotional efforts, tax concessions, and other devices designed to encourage industrialization.

#### VII. *Factors that Might Intensify the Agricultural Adjustment Problem*

In my presentation I have assumed that the rate of adoption of new techniques in agriculture will not be greatly different in the next ten or fifteen years than it has been from 1940 to date. This assumption may



well be too conservative. Television may prove to be a more effective medium than any of the previously existing mass media. Sociologists are giving increased attention to the processes by which information is diffused and the influences that lead different groups of farmers to adopt new techniques. Cooperation between economists and agronomists, agricultural engineers, and livestock production experts, as exemplified by the work of Earl Heady and others, should also increase the productivity of agricultural research by demonstrating the *economic* relevance of new techniques with a much shorter time lag than in the past.

Finally, there is the possibility that technical change will be accelerated by the widespread transfer of some management functions from individual farmers to feed manufacturers, food processors, and other manufacturing or distributing organizations. The growth and present status of the broiler industry is the most dramatic case so far. Similar developments could occur in the production of eggs and hogs and in cattle feeding. Contracts have been used for many years in connection with production of vegetables for canning and freezing. With these contractual relationships comes an opportunity for the processor to specify seed varieties, time of planting, and the whole range of cultural practices. A considerable proportion of the cattle in California feedlots is being "custom fed" for packers and others. A "hog-leasing" arrangement is being tried out by a Midwest feed manufacturer. Large retailing organizations have an interest in regularizing their supplies of farm products on a standardized quality basis. Even if they did not make contracts directly with individual farmers they *could* exert a similar influence toward uniformity through contracts with food processors or farmers' cooperatives. As I understand it, feed manufacturers may lay down rigid specifications to the farmers who raise broilers for them. A large cooperative interested in marketing high quality eggs may arrive at nearly the same point—it may hire full-time experts to tell the farmer members what practices they must follow if they are to market eggs through the cooperative. In effect, agents are hired by the farmer members as a group to tell the individual members what to do.

Obviously, centralization of management decisions in large firms or cooperatives may accelerate the adoption of improved practices and also hasten the trend toward specialization in areas that now practice general farming. Studies made of economies of scale (i.e., size of farm) in general farming areas are reassuring as to the competitive efficiency of the family farm. But this does not mean that the technical know-how and managerial ability of the average farmer will enable him to avoid vertical integration (or horizontal agglomeration) of some of his management decisions if the optimum techniques known to specialized researchers



are greatly superior to typical farming practices. If the latter is true, farmers who accept centralized management and quality control may make higher incomes (at least in the earlier years) than those who go it alone.<sup>12</sup>

The implications of this trend for agricultural adjustment, as well as for the family farm deserve intensive study. At the very least they mean that in addition to new technology as such farm people must be prepared to adjust to new patterns of organization of economic activities and new distributions of managerial responsibility and financial risk among farm operators and others.<sup>13</sup>

<sup>12</sup> For many farm operators, inadequate education is an important factor in the acceptance of outside managerial and technical guidance, particularly when these are tied to the incentives of higher income and additional capital supply. Although Iowa ranks near the top among the states in such measures as farm operator levels of living and extent of literacy, a recent unpublished survey of 10 Iowa counties indicates that educational deficiencies still are a serious problem. In these counties, among the commercial farm operators under 38 years of age, 38 percent had not graduated from high school; 70 percent had no 4-H Club experience; 73 percent had no GI farm training; 88 percent had no vocational agriculture in high school; and 84 percent had had no participation in organized adult classes. Only 6 percent had one or more years of education beyond high school.

<sup>13</sup> Changes of this sort would of course affect the informal leadership patterns of rural communities and have considerable impact on the value systems of the young people growing up in them.

## DISCUSSION: GUIDING AGRICULTURAL ADJUSTMENTS

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Karl Fox pursues an eclectic approach in this paper that enables him to present a wide range of ideas and information in an effective manner. With most of these ideas and pieces of information, standing alone in this eclectic approach, I find little to criticize or comment upon. Most of us would agree with most individual statements in the Fox paper.

But I submit that the Fox approach is not truly eclectic; a theme runs through the Fox paper. This theme is organized around farm labor mobility. And this theme has two variations: the first is concerned with projected, or expected, migration out of agriculture and the second is concerned with this out-migration as a solution to the chronic and continuing surplus problem in agriculture.

The two variations of this farm labor mobility theme are intertwined in an almost inextricable fashion. Whether this intertwining is conscious, or unconscious, is irrelevant to this discussion (although in more personal discussions running into the night it may be fun to speculate on which is

the case). But the fact that these two variations are intertwined is important and disturbing. The reader is never completely sure as to whether the material presented on farm labor mobility refers to what is occurring, or what ought to occur. And more important the reader is left in the dark with respect to whether the out-migration that is occurring will accomplish that which in the Fox view ought to be accomplished. There is a convenient blurring of what is with what ought to be with respect to farm labor mobility, that leaves the larger issues beclouded.

One can, for example, accept the view that the number of workers in agriculture is going to decrease dramatically in the next decade, without accepting the view that this exodus is going to correct the chronic overproduction in agriculture. And one can hold the view that a further reduction in the number of workers in agriculture is desirable in the context of general economic growth and development (which I do) without subscribing to the view that a rate of labor transference out of agriculture consistent with general economic development will correct the surplus problem in agriculture. And one can even approve of programs designed to speed up the flow of workers off the farm, without reaching the conclusion that such programs will bring the rate of aggregate output expansion into balance with demand expansion.

To come directly to the point, I believe that we are going to experience an important decline in the number of workers employed in agriculture between now and 1965. I suspect that the data cited by Fox from an unpublished Iowa study are of the right order of magnitude for Iowa and the nation. He states, you will recall, that "If trends of the past decade continue, farm employment in Iowa will decline from 281,000 in 1950 to about 214,000 in 1965—nearly a fourth." But, accepting this projection, do we have any reason to believe that such a rate of migration out of agriculture will reduce total farm output, or even slow down the rate of aggregate output expansion? I don't think so. Certainly a comparable rate of decline has not moderated the surplus problem during the early and middle 1950's. In sum, we have and we continue to experience a rapid decline in employment in agriculture without experiencing any reduction in aggregate farm output. Widespread farm technological advance has made this possible. And I foresee no decline in the out-pouring of new technologies and practices, or their adoption over the next decade.

Now what does Karl Fox think about all this? Well he thinks several things. He thinks first that "The prospect is that there will be considerable slack in our farm economy for at least a decade, . . ." Referring to the difficulties of slowing down the rate of farm technological advance he thinks that "We are thus thrown back upon increased labor mobility as the principal means of adjusting agriculture to economic growth." And

reflecting on the difficulties of expanding demand and developing new markets he thinks "... that most of the relevant methods for facilitating adjustments operate directly or indirectly to increase labor mobility." In other words, Fox does not believe that labor mobility left to itself, or aided and abetted, will correct the farm surplus by 1965, *but increased labor mobility is all he has to offer as a corrective*. He has nothing else to offer because it has become a part of his creed that "Over the longer-run, the orthodox solution requires a transfer of labor out of agriculture until the marginal value product of the labor remaining becomes equal to that of similar labor applied in other economic sectors."

Now Karl Fox, who enjoys a reasonably good and stable income and whose marginal value product might prove difficult to estimate, is entitled to this belief, this creed. And the logic is, of course, unassailable: take workers out of agriculture long enough and a point in time must be reached where the marginal value product of those remaining must rise. But let me ask a series of what seem to me to be pertinent questions. First, what about those farmers working and living between now and 1965? Have we no interest in, no concern for, the economic well being of these farm people? Second, how many people in this audience really believe that, if we should succeed in reducing the total working force in agriculture by 25, or even 35, percent within the next decade, we would bring the rate of aggregate output expansion into balance with the rate of demand expansion? I have been told that agriculture could be organized into 500,000 large-scale family farms without any over-all loss in efficiency, and perhaps with considerable gain. And third, how many of you would want to suck 35 percent of the laboring force out of agriculture within the next decade, with all the social disorganization in both rural and urban areas that such a rate of mobility would entail? I would ask—Are not there limits to the rate of mobility that a society can digest? People are not sacks of cement to be shipped around to the highest bidder. They are part of a social fabric, and when you move too many too fast you destroy that fabric.

As any practitioner of policy (i.e., the politician) knows the well being of the citizenry must be considered in the short run. If it is not, and the government is a responsible one, the politicians do not survive to become statesmen (i.e., consider long-run problems). And such is the case in agriculture today. To deal with pressing, present-day income problems in agriculture, we have the largest, most expensive and most untidy program of price and income support in peace-time history. It is a program that almost no one likes including the administration, but I would guess that it will not change too much before 1960; next year is an election year again, and for the time being foreign surplus disposal is working tolerably

well. But in time it must change; there are too many discordant notes in it: large out-of-treasury costs, foreign criticism, soil-bank scandals, etc. What then?

Fox says increased labor mobility. I say that we must have labor mobility and expect a declining labor force in agriculture, *but that mobility is not enough*. Falling price and income elasticities and widespread farm technological advance in a competitive market organization have placed farmers on a treadmill, and expected reductions in the farm labor force will not be great enough to get the average, the representative, farmer off of that treadmill. Last winter at Cleveland, and in a little book entitled *Farm Prices—Myth and Reality* to be published this winter, I say that the answer will be found after many trials and tribulations in the general acceptance of and the widespread and continued use of production and marketing controls. But that is another story—one that does not fit my role here of a discussant.

Now one final comment: Fox has a little fun in his paper with those of us who refuse to draw policy conclusions from purely competitive models for application in a world where bargaining power counts and is unequally distributed. I should like to enlarge upon that funny, and perhaps turn it around.

In that brief digression, Fox clothes himself comfortably in a "new orthodoxy" and consigns some of the rest of us to the underworld of heretics. Viewed from the vantage point of a citadel of higher learning in the advanced economy of the North Central states he does belong to a tight little band of orthodoxy. But should we chance to stray into agriculture itself, we would soon discover that many farmers and producer groups are thinking seriously these days about production and marketing controls. In fact I now find myself sought after for advice and counsel by commodity groups that a few years back would never have dreamed of coming to me. In short, I find that I am becoming orthodox, conventional, *among producer groups*. Thus, it may be that Karl Fox is somewhat confused with respect to who is wearing the orthodox hat and who the screwball hat. If his labor mobility "medicine" does not do more for agriculture incomewise in the next seven years that it has in the last seven, he may yet turn out to be the odd one.

## FOREIGN TRADE AND AGRICULTURAL POLICY

Chairman: Alex H. Turner, Department of Agriculture, Canada

### AGRICULTURAL TRADE AND U.S. FOREIGN POLICY

LAUREN SOTH

*Des Moines Register and Tribune*

ONE fact, one over-riding threat, dominates world affairs—the annihilating power of nuclear explosives. Wars always have been horrible, but never in history has it been possible for mankind to destroy itself. It is today. As a consequence, prevention of war is assuming higher value than ever before in the order of foreign policy goals of this country and of other countries. President Eisenhower has expressed this by saying, “there is no alternative to peace.”

In the past, making war has not always been a last resort of nations, including our own. We are moving into a period when, I believe, regardless of progress on disarmament agreements, the use of the ultimate instrument of foreign policy, war, will be more carefully restrained than ever before. The awful possibilities for unlimited war will tend to limit war.

Whether I am right in this wishful thinking or not, however, instruments of foreign policy other than war are growing in importance in the age of the atom. The Soviet Union, still marching toward ideological supremacy and the spread of Communism, has been placing more emphasis on the weapons of trade, capital investment and propaganda.

We in the United States are responding to the new facts of international life, also. We are beginning to appreciate the dangers to world peace latent in the underdeveloped or poor countries of the world. We are beginning to see our interest and our responsibility in the drive of the Asians, Africans and Latin Americans to free themselves from want.

The revolution in attitudes and desires of the underprivileged people of the world matches the revolution in military strategy in its effects on foreign policy. The non-military instruments of foreign policy are gaining in significance as the futility of nuclear warfare becomes imbedded in world consciousness. They also are gaining in significance because they are the *only* way to deal with the world revolution of the underprivileged.

Perhaps what I am saying adds up to this: World affairs are growing more dominant in our lives. It is becoming more difficult to distinguish between domestic policy and foreign policy. Everything we do as a nation has impact abroad. Every action we take must be judged as a matter of foreign policy. Fifteen years ago, the concept of “One World” was a revelation; today it is a cliché.



I turn now to my assigned subject of agricultural trade in relation to foreign policy.

## I

Among the nonmilitary instruments of foreign policy, or perhaps it would be better to say nonmilitary factors affecting foreign policy, agricultural trade seems especially likely to become more significant.

The reason is that in the countries where the world revolution is brewing, 80 or 90 percent of the people make their living from farming. Agriculture is necessarily our major point of contact with the one-third of the world that is in ferment. Trade in farm products profoundly affects the rate of progress in the less developed areas.

Since 1934, when the reciprocal trade agreements act was passed, the advertised general trade policy of the United States has been to increase the volume of trade, by lowering trade barriers in return for similar action by other countries. In practice, this general policy has been fragmented and based on expediency in individual actions. We have reduced tariffs substantially on many commodities that were not highly protected anyway. But we have maintained or strengthened protective devices for industries facing sharp world competition. The yardstick has been what will benefit American commercial interests in the immediate future. This has been particularly true in agricultural trade, where we have imposed quotas on the one extreme and dumping programs on the other.

All our trade policies and arrangements need to be reexamined in light of the new conditions of military strategy and the revolution of rising expectations in the poor countries. We must give greater weight in the calculus of trade policy to the factor of what is good for the peace of the world. If I may borrow a word from the Marxists, we can no longer tolerate the "contradictions" between our agricultural trade policies and our over-all foreign policy for world progress and peace. These contradictions were tolerable in the gunpowder age. They are not in the atomic age.

## II

The United States needs more imports. The rest of the world needs more American dollars. For a good many years, other countries have been unable to repay their debts to the United States and have been unable to buy as much as they would like to buy from us.

American imports have been less than American exports for nearly 100 years. From the early 1870's up to the end of World War I, this surplus of exports was used to pay off foreign debts. Since then, the United States has been rapidly increasing its foreign investments, and in recent years, has been making outright grants to other countries which have financed the export surplus. America's foreign investments undoubtedly will in-



crease in the years ahead and should increase. A continued export surplus is inevitable for the greatest capital-goods producing country, the richest country, of the world.

But ultimately, if America is to maintain an export volume as large as the present one, we will have to expand imports—unless we wish to give away a large share of our exports indefinitely. The investment process itself leads to increased imports in the long run.

Increased imports are important to the United States to permit balancing our export trade at a higher level and to permit returns on our foreign investments. But most important, they are a necessary part of an intelligent policy of promoting world economic growth. They are the best way to encourage additional private investment abroad. The underdeveloped countries are vitally interested in expanding their exports to the United States. This would make the capital they need from the United States more available; it would permit them to buy more of the industrial goods they need from the United States; and it would give them a feeling of pride in earning their way instead of being the recipients of charity. Every country prefers to earn the dollars it needs for necessary purchases in the United States rather than to receive grants. The next best alternative is to get loans and to be able to repay those loans by exporting to the United States.

The Soviet Union is playing up to this intense national pride of the newly independent countries and seems to be making a good deal of headway with its loan program in Asia. The Russians do not make grants; they do not give "aid." They make what they call straight business loans. But they also agree to take the exports of the borrowing country—for example, the cotton deal the Kremlin made with Egypt last year.

Favorable credits at interest rates of 3 percent or less are being granted by the USSR in Southeast Asia. The loans are repayable in either domestic products or in local currency. The total outlay of Soviet credits as of early 1957 is estimated to be equivalent to around 1.2 billion dollars. The Soviet Union is a natural trading partner for countries of Southeast Asia eager to industrialize. It has stepped up production of machine tools and other industrial equipment sharply since 1950 and has such goods available for export. Moreover, the Russians are willing to take industrial raw materials and food crops, such as rubber, cotton and rice in return.<sup>1</sup>

This is tough competition for the Western democracies in the struggle for influence in Asia.

To summarize, our national interest in a large volume of trade, in

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<sup>1</sup> *Soviet Survey*, published by the Congress for Cultural Freedom, London.

progress of the poor countries and in meeting Soviet competition all argue strongly for a policy of enlarging imports.

### III

This isn't as easy as it sounds. The United States economy is so productive, its mass-production industries are relatively so efficient, that it is difficult for other countries to find goods they can sell us. Lowering tariffs on the low-labor-cost goods that America produces in such abundance would not increase imports greatly.

Americans *could* economically increase their purchases of high-labor-cost goods and services from overseas—handcraft goods, luxury items of all kinds, shipping services, tourist travel including hotel and restaurant services—and, agricultural products. There is no doubt that Americans *would* buy a great deal more of these kinds of goods and services from other countries if trade barriers were lowered. The tariff and quota limitations that are really effective in holding back imports are those covering items with high labor cost.

If the underdeveloped countries are to earn dollars, they must sell agricultural products and minerals to the United States—or to other countries that can earn dollars by exporting to America. These raw materials are about the only goods they have to sell. Yet these are goods against which the United States erects its stiffest trade barriers. And these barriers have not been substantially reduced under the trade agreements program.

Import restrictions plainly are pulling in the opposite direction from that taken by our general foreign policy. If we are serious about trying to stimulate economic growth in the overpopulated, underdeveloped countries, then we ought to find ways of buying more of their exportable products and services. If we want these countries to earn dollars instead of rubles; if we want to combat the drive of international Communism for power and influence, then we must look toward establishing a positive import policy.

What is required is not just congressional approval of the reciprocal trade agreements authority of the President every three years, or approval of the proposed Office of Trade Co-operation, but the setting forth of a clear policy of expanding imports *more than* exports. Such a policy may be impossible of fulfillment in the immediate future because of the vast amount of government and private loans that will be flowing into dollar-short areas. But narrowing the gap between imports and exports should be a main goal of trade policy.

What America and the free world need right now is not *reciprocal* tariff reductions but relatively *greater* tariff reductions by the United

States. The poor countries, and for that matter some of the more well to do, are forced to limit their dollar expenditures. They would need to continue to ration dollar spending even if the U. S. opened its ports to much larger imports.

Let me make clear that what I am suggesting here is not an alternative to government grants and loans to the less developed countries. "Trade not aid" is an inadequate policy. It must be "trade *with* aid."

The United States ought not to require a *quid pro quo* for each trade concession. A larger flow of imports into North America ought to be *sought* by American statesmanship as a good thing in itself that will promote the national interest and could be pursued by the United States acting alone.

Now, of course, such a bold policy of expanding trade would cause us some domestic difficulties. Farmers producing sugar, wool, meat animals, oil seeds and several other kinds of commodities would suffer sharp declines in prices and incomes if their protective quotas, tariffs and price supports were removed. A positive import policy would force a revision of this nation's agricultural policy. We should not minimize the difficulties. But let us not exaggerate them either.

The United States is the giant economy of the world—the most flexible, the most able to make internal adjustments. The adjustments required by an open import policy would be far less drastic than the changes the American economy has taken in its stride in the last several decades as a result of war, the cold war and the introduction of new technology.

But the question is not whether adjustment to a larger volume of imports would cause some pain or not. The question is whether it would be better, considering our stake in a vibrant, growing free world, for us to make these internal rearrangements or for us to let India, Japan, Burma and Indonesia try to accommodate themselves—or turn elsewhere for trade.

My contention is that the world crisis created by the threat of nuclear war and the revolution against poverty puts upon the United States the responsibility of adjusting its economy to meet the needs of the free world.

If the perils of world war should govern our policy, then must not we make the classical exception to free trade—protect the industries that are vital for war? The national defense argument is being worked hard these days; even the watch industry made its pitch for invoking the escape clause in the trade agreements on this ground. But self sufficiency in war seems an untenable, almost ludicrous, reason for trade barriers in the atomic age. An all-out nuclear war, some military leaders tell us, would be ended in a matter of days. Industrial plants, transportation systems, distribution would be paralyzed. Getting raw materials would not be the

big problem—and it would be as easy to get them from overseas as from domestic sources, maybe easier. Building up capacity to produce wool, zinc or other raw materials for an extended war just doesn't make sense. Any conceivable brush-fire war in which we might be engaged would not cut off our supplies of vital materials.

The objective of policy today, I repeat, must be to *prevent* war, not to *wage* it.

A minimum import policy on agricultural products that would fit in with such a foreign policy would be to let imports of commodities now tightly restricted grow as fast as the total demand for these commodities grows. That is, we could meet increases in demand, due to population growth and rising income, for sugar, wool, vegetable oils and such items from foreign sources instead of expanding the domestic industries.

In the last five years our imports of agricultural products actually have been declining in dollar value, especially of competitive products. Despite the trade agreements program, the United States has been growing more restrictionist on agricultural imports. Competitive products make up a smaller percentage of total agricultural imports than they did in the 1930's.

#### IV

Our agricultural trade policy on the export side also at times has conflicted sharply with general foreign policy.

Accumulation of excess reserves under the price support programs has led to extensive dumping of basic crops such as wheat and cotton on world markets. This, of course, infuriates friendly countries that also export these crops. American price supports, which priced our products out of some world markets, tended to build up export business in wheat and cotton for other countries for a good many years. Then we turned around and undercut these smaller countries by offering our own surpluses on world markets at cut-rate prices.

Many other countries do the same thing, of course, and this is often given as an excuse for American dumping. But the United States happens to be in a position where it cannot follow the same rules that apply to lesser powers. Nationalistic trade policies are acceptable in world opinion for weak countries struggling to accumulate capital and build up their economies. They are not for the United States.

In the last three years of our surplus disposal programs, world prices of basic crops have been relatively stable, and on the whole, exports of other countries have not declined. So it could be argued that American disposal programs have not injured other exporters. However, the American share of world exports of wheat, foods, fats and oils, cheese and non-fat dry milk, and of feed grains has risen in these three years. In the last year, the Commodity Credit Corporation sales program for cotton at

competitive prices has pushed the U. S. share of world cotton exports upward, also. The disposal programs undoubtedly have displaced exports from other countries and kept world prices down.

While the United States sells farm products overseas at prices below its domestic prices, some of the struggling new countries of the world are doing the reverse. These countries have introduced government monopolistic marketing arrangements for export crops to buy from their own producers at prices well below export prices. Here we see government acting as a price depresser instead of a price supporter. This is a convenient way of accumulating capital in a poor agricultural country. Profits from these operations are used in some countries, such as Burma and Thailand, for financing government expenditures, especially for economic development.<sup>2</sup> (The Communists in Russia under Stalin, of course, carried this policy of exploitation of farmers to the ultimate—by using brute force as well as monopoly buying prices.)

When the United States employs its great financial power to take world markets away from countries that must live by exporting farm products, it is injuring these countries and undercutting its own policy of promoting world economic development.

However, American agricultural surpluses *can* be furnished to other countries in such ways as not to interfere with commercial exports of other friendly nations and actually to *promote* economic development. The purpose of Public Law 480 was unashamedly to get rid of farm surpluses, and, to some extent, Section 402 of the Mutual Security Act also had the same motivation behind it. Nevertheless, through the devices authorized in these laws—sales for foreign currency and barter for strategic stockpile materials—we may be developing a new, imaginative way of using America's agricultural abundance to strengthen foreign economic development programs and support our foreign policy.

If the sales for foreign currency are carefully planned so as not to displace regular imports and to provide a net addition to the supplies of the receiving country, they can contribute to economic development.

There are obvious limitations to what can be done in this way. Hard currencies are the primary need of underdeveloped countries for buying equipment, machinery and other items obtainable only from advanced countries. Local currency obtained by sale of farm products and loaned back to the recipient country must be used largely to pay labor or buy local raw materials. A study in India by the Food and Agriculture Organization of the United Nations indicated that, even in projects where the cost of labor is highest in relation to other expenditures, only rarely can more than half of the total costs of a project be covered by local

<sup>2</sup> See article by A. Hazlewood in *The Economic Journal*, London, March, 1957.



currencies. To cover 30 percent of the grants or loans for economic development with surplus foods would seem to be a reasonable prospect in countries like India.<sup>3</sup>

Though sales of farm products for foreign currency are not a *substitute* for dollar loans and grants in stimulating economic development, they are a useful *supplement*. One of the reasons for low production in the poor countries is inadequate diets. People cannot work long and hard simply because they do not have the required health and energy. So providing extra food is an important assist to economic progress. But it must be *really* extra, not just a way for the country to save foreign exchange.

We have not explored all the possibilities for assuring that our food surpluses will improve diets. One suggestion is to establish in-plant or on-the-job feeding programs, school-lunch programs and the like—with American technical and administrative guidance. The objective must be to elevate food standards, not just to get rid of our surpluses.

The Department of Agriculture approach is to get the stuff out of this country without much thought as to how the programs fit into general foreign policy. This raises the question whether it is wise to leave major responsibility for sales of farm products for foreign currency in the hands of the public official who also has charge of farm price supports, production control and management of reserves.

If foreign currency obtained from sale of farm products is not loaned back for use in economic development projects, it ought to be spent carefully to make sure that it does not displace dollar spending. If foreign currency is used for upkeep of diplomatic missions, paying troops or other U. S. government expenses, it reduces by that much the number of dollars available to the host country. So, if we are going to make maximum use of surpluses as foreign economic aid, the foreign currency should be loaned back or it should be spent on items that would not be bought otherwise with dollars. For example, such currency might be used to finance more exchanges of professors, students, artists, and technicians in various fields. But the best thing is not to "spend" it currently at all—but to make it available on loans.

Now, of course, all this business of sales for foreign currency, barter deals and the like is state trading. That has a bad sound to many people. But the facts of life are plain; bilateral trading is the rule in the world today, not the exception. Nearly every country has price supports, marketing controls and other forms of government intervention in agriculture and agricultural trade. There are no signs that the United States is going

<sup>3</sup> *Uses of Agricultural Surpluses to Finance Economic Development in Underdeveloped Countries, A Pilot Study in India.* Food and Agriculture Organization of the United Nations.

to return to completely free markets or "free enterprise" for farmers. So we undoubtedly will continue to seek ways of exporting farm products with government deals of various kinds.

This state trading can be a real factor in strengthening the general foreign policy of the United States. Or it can be, as it has been in the past, a handicap to the general foreign policy. We need new ideas—and agricultural economists are best fitted to provide them—on how to protect farmers' incomes without interference with the nation's foreign policy.

## V

Import quotas and export subsidies are an almost inevitable accompaniment of price support programs like those we have had. Cannot farmers be assured "parity" incomes by some other methods? Price supports may serve a useful function in stabilizing farm markets, but when they distort the whole production pattern not only of this country but of others, then they are not serving the true interest of farmers or the nation.

Surely the United States is capable of handling its problem of farm adjustment internally, without shoving it off on other countries. Perhaps the answer lies in a program of more direct subsidies, not related to particular commodities, and less reliance on manipulating market prices.

Our national expenditures on defense and international aid programs add up to considerably more than the gross income of U. S. farmers from all sources, including a small proportion that might be attributed to government programs. Federal expenditures for price support and farm subsidies are perhaps running at 2 billion dollars a year, as an outside estimate, as against around 45 billion for "national security." This comparison helps put in perspective the relatively tiny government farm programs affecting a few farm products.

Is it good economy to jeopardize the results we hope to obtain in foreign policy by unwise handling of agricultural trade? Our agricultural trade policy could be brought into agreement with general foreign policy with relatively little difficulty from the economic viewpoint. But from the political viewpoint—that is something else again.

## DISCUSSION: AGRICULTURAL TRADE AND U. S. FOREIGN POLICY

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There are many wise and sensible thoughts included in Lauren Soth's paper. And I do not intend to continue this introductory praising sentence

with the all too frequent, "but." There are three points at which I would have put the matter somewhat differently or would have arrived at a different conclusion. In each case these are matters of judgment.

Before turning to these areas, I would like to call your attention to the next to the last paragraph of Soth's paper. In that paragraph, Soth compares the direct expenditures on defense and foreign aid programs to the gross income of our farmers and to the cost of our farm programs. In essence he is arguing that it is foolish on our part to attempt to rescue our present price support programs by actions in the international field that tend to jeopardize or reduce the effectiveness of national security programs on which we spend about \$45 billions a year. Soth might have added that the conceivably maximum budgetary cost of a farm program that was consistent with relatively free trade in agricultural products would be but a minor fraction of our national security expenditures. For some reason, our political processes simply have not recognized the interrelationships between what is done in domestic and international agricultural measures and what we do to improve our national security. One can hope that if Soth's paper is widely read it will contribute to the understanding that there is a definite connection.

First, I would argue that Soth may have overestimated the ability and/or willingness of the Soviet Union (a) to provide a large-scale market for the products of the underdeveloped areas of the world and (b) to act as a supplier of industrial goods in return for agricultural products and raw materials. Based on trade data for 1956, the total exports of the Soviet Union, excluding trade with the satellites and China, was \$736 millions, while imports were \$792 millions.<sup>1</sup> More than 80 percent of the exports were to the rest of the European continent, including the United Kingdom. The import picture was very much the same. The European satellites had a larger volume of exports and imports (roughly \$1,325 millions), with approximately three-fourths of the exports going to continental Europe and the United Kingdom and about the same proportion of the imports originating with the same trading partners. Two aspects of the trade should be noted. First is the small aggregate volume of the trade of the Soviet Union and her satellites with the rest of the world. The volume is less than that of any one of the following countries—The Netherlands, Belgium-Luxembourg, and France—and only slightly larger than Italy's. Second, the bloc trades primarily with highly industrialized countries and not with agricultural countries. It perhaps should be remembered that about 45 percent of the Soviet Union's population is agricultural.

<sup>1</sup> Trade data from United Nations, *World Economic Survey*, 1956, pp. 249, and United Nations, *Monthly Bulletin of Statistics*, June, 1957.

Based on data covering an estimated 60 percent of total exports, the Soviet Union is mainly an exporter of foodstuffs and raw materials.<sup>2</sup> Out of a total of \$435 million exports in 1956, only \$10.8 million was in machinery and equipment and \$87.4 million in other manufactured goods. The Soviet Union is primarily an importer of industrial goods. Out of a total of \$396 million imports, \$143 million was machinery and equipment and \$135 million was other manufactured goods. Only slightly more than a quarter of the imports were foodstuffs and raw materials. If a classification of imports from all sources were available, a larger fraction probably would consist of agricultural products and raw materials. However, given the sources of the imports, it is hard to imagine the proportion being more than one third.

One cannot say, of course, that the Soviet Union could not change the composition of its imports if the decision were made to do so. However, the possibility of changing the composition of exports, given the availability of competing sources of supply, is open to some question. The important point is that the economic and trade threat of the Soviet Union is still a potential and not an actual threat of real magnitude. This means that if the United States were to act promptly and with wisdom that little has been lost thus far. However, given another decade, the implications of Soth's comments might then be reality.

Second, I feel that Soth is guilty of a misstatement when he states that it is difficult for the United States to enlarge its imports because the "United States economy is so productive." As Soth well knows, the absolute level of productivity of the resources of an economy does not determine the volume of its international trade. Instead the pattern of relative cost differences compared with relative costs in the rest of the world determines the possible volume of profitable trade. The United States has a smaller ratio of exports (or imports) to national income than, say, the Netherlands, because our relative cost structure for producing the mix of goods that we consume has a smaller variation compared to relative costs in the rest of the world than is true in the Netherlands.<sup>3</sup> But, as Soth points out, if we were to reduce our trade barriers, we could substantially increase the volume of our imports. And I agree completely with Soth that what is now needed is not reciprocal reductions of trade barriers, but unilateral reductions by the United States. Such reductions

<sup>2</sup> *World Economic Survey*, 1956, pp. 251.

<sup>3</sup> The relative cost structure implied is in part a hypothetical one, since it includes the costs of producing goods that may be imported and not produced at all domestically (bananas in the United States) or the costs at different levels of output for products that are imported and domestically produced at the same time. Of course, I do not want to imply that demand has nothing to do with the volume of international trade, but I believe that it is less important than the supply side.

are in our own national interest, whether or not anyone else reduces trade barriers.

Finally, I feel that Soth is somewhat more enamored with the benefits of state trading in agricultural products than the world's experience with such state trading over the last two decades gives him any right or basis for so being. In my opinion, it is not appropriate policy for an underdeveloped economy to obtain funds for economic development by special punitive measures against the producers of agricultural products through such techniques as establishing domestic prices below export prices. Where this has been tried, for example in Argentina, in west Africa, and, to some degree, in Australia, the effects upon productivity and investment in agriculture has been deleterious. The basic problem of many underdeveloped economies is to obtain the foreign exchange to finance the importation of goods and services required for industrialization. It seems especially inappropriate to try to discourage those sectors of the economy that provide the major source of export earnings.

I agree with Soth that we could use state trading in agricultural products with much greater advantage than we are now using it in the promotion of economic development elsewhere in the world. I do not believe that it can be shown, however, that a redirection in our use of our agricultural surpluses would contribute as much to economic development abroad as would a definite program of reducing barriers to imports into the United States. All of the underdeveloped countries (with the possible exception of the Soviet Union) must have an ever-increasing volume of international trade if they are to utilize effectively their resources in the process of economic expansion. The United States' greatest contributions might well consist of providing as much of that international market as possible.



## THE ROLE OF UNITED STATES AGRICULTURE IN WORLD AFFAIRS

WALTER W. WILCOX  
*Library of Congress*

I AM DELIGHTED to be able to address my fellow agricultural economists on this particular topic. As you all know, American agriculture has exercised an important role in world affairs from earliest colonial times. To begin with there is little doubt that Great Britain and Western Europe enjoyed more peace and tranquility in the field of religious beliefs in the 17th, 18th and early 19th centuries as a result of the emigration of the nonconformists to the American colonies—largely to American agriculture.

Hundreds of thousands of nonconformists in religious and social customs left their mother countries in these three centuries to find a new life and to carve out an estate for their families on this continent. American agriculture began as something of a safety valve both for the population problem and for the religious and social reform groups in Western Europe.

### *Contribution to Industrial Development in Europe*

As soon as the colonies were established, they stimulated increased economic activity in the mother countries and American agriculture began its historic exports of tobacco, food and fiber. Exports of tobacco from the Virginia and Carolina colonies were more important than the exports of food and fiber in those early years.

There is little evidence that imports of food from the United States were an important factor in the industrial revolution in England in the early 19th century. After the adoption of the factory system, however, it was the availability of export surpluses from the United States that provided the food and fiber base for the industrialization of Western Europe.

When the half-dozen most important influences of American agriculture on world affairs are listed, its contribution to the industrial development of Western Europe will rank high on the list. Who can say what the course of history would have been if American agriculture had not produced an export surplus in the 19th century?

The period of American agriculture's major contribution to industrial development in Western Europe began in the last half of the 19th century and continued until the outbreak of World War I, in 1914. During this long period, imports of cotton, wheat, pork, lard and other farm products from the United States permitted a rapid rise in living stand-

ards in Western Europe at the same time that population growth and industrial development was unprecedented.

*American Agriculture between World Wars I and II*

Everyone in this audience is familiar with the role of American food in bringing relief to the famine-stricken millions immediately after World War I. Again, who can accurately assess the role of this food which saved millions of lives and contributed immeasurably to the restoration of political stability in the postwar years?

The period between World War I and II was tragic for American agriculture, American business, American diplomacy and equally tragic for world economic and political affairs. The experiences of that period have been invaluable in guiding our progress in recent years. But we paid a high price for our experience.

Perhaps one should not pass the period of the 1920's and the 1930's without giving some attention to the impact of American agriculture on world events and vice versa. There is little doubt that during this period the impact was mostly vice versa.

The sharp decline in the price of United States farm products after World War I and the failure of agriculture to share in the industrial prosperity in the 1920's led to misguided increases in protective tariffs. First came the Emergency Tariff of 1921, then the Fordney-McCumber Act of 1922 and after 8 years of continued "ailment," really strong medicine was administered in the form of the Hawley-Smoot Act of 1930.<sup>1</sup> Import duties were increased on livestock products, grains, sugar, vegetable oils and many other products. The Hawley-Smoot tariff increases were prescribed, however, by non-farm Statesmen, in lieu of the farm bloc supported McNary-Haugen bills that twice passed Congress only to be vetoed each time. Actually the tariff increases intensified rather than helped solve the farmers economic problems.

Although the economic troubles of agriculture contributed to the world-wide depression of the 1930's in other ways in addition to furnishing an excuse for raising import duties, its role in causing the downward spiral in economic activity at that time was probably overstated in the literature of the 1930s.

The Great Depression of the 1930's in the United States did have a decisive influence on American agriculture, however, and on its place in world commerce. The programs adopted to combat depression set the stage for the withdrawal of the major agricultural exports from the freely competitive world markets—a situation that has continued until our cur-

<sup>1</sup> *Our Farm Program and Foreign Trade*, by C. Addison Hickman, Council on Foreign Relations, New York, 1949. p. 55.

rent program of disposing of agricultural surpluses in foreign countries was adopted.

In the preparation of this paper several interesting hours were spent in reviewing the professional papers of that period dealing with the conflict between domestic farm programs and the goals of freer international trade. There is no doubt that a real conflict existed even though the conflict was less intense than at present.

It is difficult, however, to attach any great importance to the interferences with free world trade that resulted from the domestic farm programs prior to World War II. World traders found it more difficult to conduct their business, trying to anticipate the actions of the United States Government as well as the usual market influences on supply, demand and prices. On the other hand, subsidized exports were seldom pushed to the extent that they exceeded previous free-market exports.

Domestic production adjustment, price stabilization and diversion programs had a net effect of reducing United States exports and increasing world prices at a time when world prices for agricultural products were depressed. These influences, together with some assistance from American capital, including United States technical know-how contributed to the continued growth of production in other exporting countries. Hence, one concludes that in an over-all sense, United States partial withdrawal from world export markets in the 1930's had a buoyant effect on world prices and a modest stimulating effect on economic development in the other agricultural exporting countries.

The synthetic fiber industries in importing countries also received some stimulation. Since world supplies of food and fiber tended to be burdensome during this period it is difficult to isolate any significant adverse effects on the traditional importing countries resulting from United States farm programs.

### *Agriculture's Contribution to World War II*

The advent of World War II brought a challenge to American agriculture that was met so successfully that one could write a book about it. United States began contributing foods to our Allies through lend-lease arrangements before we became involved militarily. Food products from American farms became a part of the rations of every Allied military force in action, including the Russian forces. And when the Allied military forces were successful, shipments of food produced on American farms made a great contribution toward averting famine and anarchy in the defeated countries.

Farmers in North America enjoyed relatively favorable weather and a minimum of dislocations caused by the hostilities. Farm production in the United States and Canada increased 35 percent between 1935-39 and

1946-47—an increase not approached in any other area of the world.

United States food supplies during these war years were augmented by accumulated stocks of farm products above ground and additional productivity in the soil resulting from prewar acreage restrictions. There also is little doubt that management and sharing of food supplies during the war years was enhanced by the administrative experience gained by the Commodity Credit Corporation and other agricultural agencies in the prewar years.

### *Agriculture's Greatest Contribution*

Agriculture's greatest contribution to the shaping of world affairs might be overlooked if special attention is not called to it. American agriculture's contribution to the fabulous development of American industry and business enterprise overshadows any other role it may have played in world affairs. This has been an interdependent development with American industry producing the improved machines, chemicals and other supplies essential for ever increasing efficiency in agriculture.

My philosopher friend John Brewster ascribes much of the distinctive, dynamic thrust of American business and technology to the spirit of enterprise inherited from our Puritan forefathers and to the democratic principles formulated in colonial times. American agriculture operating in this cultural environment sought and obtained the assistance of federal-state supported research and educational institutions now called the Land Grant College System.

With the help of these land grant institutions and American industry, United States farmers soon became the most efficient agricultural producers in the world. Without the cheap food produced by American farmers and the progressive release of more and more workers from the fields and farm yards, industrial development in the United States could not have made the progress it has. And there can be no argument that the high level of industrial development gives the United States its current position of leadership in world affairs.

To some this may sound like agricultural fundamentalism: The position that since food is basic to life, food production is more important than other economic activities in modern society. No such extreme claim is intended. Current American industrial development is not primarily based on the tremendous productivity of American agriculture. Yet there is little doubt that industrial development would have been slowed down greatly if half or more of our people had been required in food and fiber production and if food prices in the United States had been based on the cost of imports from other parts of the world. Actually the percentage of the total labor force employed in agriculture has declined from 31 percent in 1910 to 10 percent in 1955.

Parenthetically, the current problems of agriculture grow directly out of these particular developments that permitted it to make such a great contribution to national industrial progress.

### *Importance of Family Farming and Improved Technology*

It seems appropriate at this point to mention other aspects of American agriculture's role in world affairs often overlooked. Two immediately come to mind. The first is the social and economic success of the family farm in the American cultural environment. This aspect of American agriculture has played a dominant role in guiding land-reform activities in most of the underdeveloped countries of the world in the past 10 years. Land-reform programs in Korea, Japan, the Philippines, Italy and Egypt in particular have utilized the successful American family farm experience. Here one senses a danger that because of its success in the United States and Western European environment, the family farm approach may be prescribed in cultural and economic situations where it is not adapted.

The second contribution which might be overlooked is the export of agricultural technology. United States agricultural technicians are playing a leading role in the world-wide technical assistance programs of both the United States and the United Nations. Social and economic progress in the underdeveloped countries of the world is as much dependent on technical progress in agriculture as on industrial development. Indeed, there are some indications that a more productive agriculture must come first.

Technical progress in agriculture and industrialization are interdependent in underdeveloped countries as well as in the United States. Workers must be freed to man the machines of industry and industry must provide jobs for the workers freed by technical progress in agriculture. Also, without increased food production in most of these countries workers will not have the health and vigor necessary for rapid economic development.

In the century ahead the export of American agricultural technology and technologists may prove to be agriculture's greatest role in world affairs. Certainly it is likely to be more important than the exports of American farm products. This is merely a personal estimate and it is not based on an assumed decline in farm exports. Rather, it is based on the evident and assumed great opportunity for world betterment through the adoption of improved agricultural technology.

### *Agriculture's Contribution to Freer Trade*

Before turning our attention to American agriculture's role in world affairs in recent years, its changing role in formulating broad foreign



trade policy in the halls of Congress is worthy of note. Historically the congressional delegations from the South have been for freer trade and lower tariff policies. In terms of numbers of congressmen and senators the freer trade interests from the cotton and tobacco South have had greater representation than the protectionist interests of the rural Midwest and West. The industrial oriented legislators in combination with midwestern agriculture's representatives were responsible for the Hawley-Smoot Tariff Act of 1930. But this is past history. In recent years United States trade policies have tended toward more restrictions and the southern agricultural interests no longer exercise their strong opposition.<sup>2</sup> Industry has become important in the South. Southern congressmen are increasingly influenced by the restrictionist interests of these new industries as well as by the restrictions required by domestic farm price support measures. No longer can one say that the Solid South consistently favors freer trade policies.

### *Effects of Current Agricultural Policies*

Now that the many important but noncontroversial aspects of American agriculture's role in world affairs have been briefly sketched, attention can be centered on the more controversial aspects of the current scene. Trade reports and news items indicate there is much concern on the part of other countries about current agricultural policies in the United States especially as they influence exports.

Perhaps if they were more fully aware of the magnitude of the productive capacity of American agriculture and the sharp price discounts required to move excessive supplies into use they would be even more apprehensive. Surely United States policies to date have reflected a substantial concern for the interests of agricultural producers in other exporting and in the importing countries. And there is little doubt that this concern for the legitimate interest of others will continue.

But the nature and the intensity of the agricultural supply and income problem in the United States is such that it will continue to create international trade problems for some time. In spite of a 16-percent reduction in estimated labor used, returns to all labor and management in agricultural production fell from 89 cents in 1947-49 to 70 cents an hour in 1956.<sup>3</sup> The fact that farm output increased 13 percent during this period is not unrelated. In contrast to the decline in hourly earnings of farm labor from 89 to 70 cents an hour, workers in manufacturing in-

<sup>2</sup> Howard S. Piquet, "Some Aspects of Reciprocal Trade Agreement Legislation," *Social Science*, Vol. 24, no. 4, 1949. Also, staff papers presented to the Commission on Foreign Economic Policy, February 1954, pp. 266-268.

<sup>3</sup> After allowing interest at 4% percent on capital. These and most subsequent data in this section were taken from *Senate Document 18, 85th Cong., 1st sess.* Prepared by the U.S.D.A.

creased their earnings during this period from \$1.33 in 1947-1949 to \$1.98 an hour.

The above facts tell only a part of the story. Farm income would have fallen at least 20 to 25 percent lower except for extensive government price support operations. In each of the last 4 fiscal years net government purchases and nonrecourse loans have accounted for \$2 to \$3 billion of the income received by farmers. In view of the inelastic demand for wheat, cotton and a number of other price supported products gross and net farm income under actual production levels would have been at least \$2 to \$3 billion lower except for the price supports.

Returns to all labor and management in agriculture has varied from 65 to 80 cents an hour in the past 4 years. Except for the removal of \$2 to \$3 billion of farm products from commercial markets each year by price support activities, it is estimated that returns would have varied from 46 to 59 cents an hour. Even more discouraging are the implications of the latest analyses of farm price specialists. They indicate to me that in spite of efforts to expand markets and adjust production, in the next year or two if price supports are lowered to levels that would permit all current production to move through commercial markets, net farm income and returns per hour of farm labor will decline 20 to 25 percent from current levels. Some farm organizations and farm leaders, perhaps believing the decline would be less, favor such a reduction in farm support levels and related activities. Other groups, perhaps believing the decline would be even greater, resist any changes in existing price support policies until more satisfactory intermediate programs or compromises can be achieved.

Basically the people in the underdeveloped countries of the world are short of food and fiber while production in commercial exporting countries is excessive for commercial market outlets at reasonably stable prices.

No attempt was made to price United States exports of basic price-supported crops competitively or to bridge the gap between need and commercial market demand in 1952 and 1953 when stocks began to accumulate in the United States. In 1954 Public Law 480 was passed which permitted the sale of United States farm surpluses for local currencies, and authorized expanded barter programs and grants of food in emergencies. It was late 1955 and 1956 before shipments were made under this program in volume. The government also adopted a competitive pricing policy on cotton in 1956 which is still in force.

Everything of importance to date, however, has been either emergency legislation, or temporary administrative policy. No agreement has been reached on new long-run policies adapted to the current situation. There

is general agreement that the flexible price support policies adopted in 1954 are not adequate. The production control features of the Soil Bank are losing support. There is agreement among economists, politicians, farm organizations and farmers that the old price support programs are inadequate. Agreement does not go beyond this, however.

We have the technical ability to build hydrogen bombs and intercontinental missiles. It is frustrating to have to observe that as yet we do not have the political and economic ability to develop farm programs that give farm products a substantial part of the price stability and bargaining power enjoyed by other products in our economy.

The outlook for an improvement in this situation is not good. Techniques of price support available could be applied only to that portion of the total production utilized in domestic markets without having significant adverse effects on production, prices and commercial movement of supplies for the export market. These may be tried within the next few years, although they now are opposed by important farm groups. The other alternatives appear to be either an indefinite continuation of current marketing quotas on cotton, wheat, tobacco, rice and peanuts or a general disintegration of farm price support activities that also would have substantial international trade repercussions.

Without attempting here to plot the course for moving out of the current muddle, let us shift our attention to the future. There is little doubt that American agricultural exports will play a larger role in world affairs in the next two decades than in the two decades prior to World War II. Cotton, wheat, fats and oils and tobacco will continue to be the leading exports.

#### *Future Problems*

Relatively large supplies of these export products are expected to continue even though livestock production is increased substantially in the United States. Projections of farm production trends in the United States indicate that both domestic and foreign markets for farm products will be under pressure from abundant supplies for an indefinite period ahead.

In view of these expectations social scientists and the food and agricultural statesmen of the world have an unusual opportunity. Can they develop the means by which a part of American agriculture's excessive output will be effectively channeled into productive use outside of regular commercial channels? On the one hand additional food is needed in the underdeveloped countries of the world as they attempt rapid economic development. On the other hand unless new types of credit are developed, although supplies are burdensome in relation to commercial market outlets, only a part of the need can be filled through these markets.

Obviously American agriculture will play a much more important role in world affairs in the decade ahead if bilateral or multilateral programs of distribution are developed to supplement the international food markets serving underdeveloped countries. One approach might be a continuation of a greatly restricted program of sales for local currencies under Public Law 480.

There is danger that P. L. 480 will be discredited along with existing domestic farm price support programs. The adverse effects on normal commercial trade of current sales under section I of P. L. 480 are antagonizing our competitors in world markets. A rebellion against the high cost of the current program is also brewing. However, if and when domestic price support programs are sharply revised a modest sale of American farm products for local currencies may be desirable. It could assist greatly in balancing supplies of farm products with market outlets. It also would assist in promoting economic development in the underdeveloped countries of the world.

### *Conclusion*

In conclusion, the outstanding characteristic of American agriculture in the past 100 years has been its high productivity and its inability to contract production when market outlets were inadequate.

American agriculture was developed by pioneering people, first from the mother countries and later from the eastern colonies and states. In spite of much emphasis in the literature on farming as a way of life, at least half the farm families consider it a business in the best tradition of American businessmen. As a result of their business management they have adopted technological innovations parallel to those adopted in other industries. If our current export of agricultural technology could be supplemented with authoritative information on the cultural factors that led to its rapid adoption in the United States, the role of American agriculture in future world affairs might be great indeed.

United States and United Nations technical assistance programs will achieve greatly increased results when a larger part of the total effort is devoted to educational and training efforts centering on the social, economic and other cultural factors that have facilitated the rapid adoption of technological improvements in the United States. If this is done there is little doubt that American agriculture's greatest role in the future of world affairs will be its contribution of cultural experience and technical knowhow.

This does not infer that exports will be unimportant. The future development of commercial agriculture in the United States, including long-run export policies, or lack of them, is in a more critical position today than many people realize.

Problems associated with assuring agriculture reasonable rewards for overabundant production (which it cannot change quickly) and finding ways and means of effectively utilizing this overabundance are among the more important problems in urgent need of attention by social scientists. The latter problem is especially challenging since the overabundance is only in relation to market outlets. There is no overabundance in relation to physical need.

The role that American agricultural production plays in world affairs in the future will be greatly influenced by social scientists contribution to the solution to these two problems. What changes in business practices and regulations will assure farm businessmen reasonable rewards for their high level productivity in an economic society dominated to an important extent by the interests of large corporations and large labor unions?

And, what arrangements will assure that the overabundant market supplies of food and fiber produced in United States and other Western countries will make a maximum contribution to the economic development of the Free World?

#### DISCUSSION: THE ROLE OF UNITED STATES AGRICULTURE IN WORLD AFFAIRS

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Dr. Wilcox has presented a moderate and well-balanced review of the role of U. S. agriculture in world affairs. Hence, my comments on his paper will be primarily supplementary rather than critical.

Wilcox has recognized some of the shortcomings of the use of Public Law 480 in disposing of our farm surpluses abroad. However, I believe that he has not been sufficiently critical of its effects either at home or abroad. First, the program has been extremely costly. Thus, as of January 31, 1957, the farm products disposed of abroad under Public Law 480 had cost the Commodity Credit Corporation (including ocean transportation) \$2,885 million and were sold at a market value (including ocean transportation) of \$1,987 million, representing an initial loss of \$898 million. However, of this gross "market value," only 36 per cent was directly recovered by military procurements or payments of U. S. obligations. At least \$1,112 million (56 percent) essentially amounted to a gift, from the United States to underdeveloped countries, of its receipts in local currencies for use as internal loans "to promote multilateral trade and economic development." Thus, on these "sales" of surpluses abroad through January 1957, the United States has actually recovered only about 30



cents on each dollar invested in the surplus stocks moved abroad under Public Law 480, in the process incurring losses of \$2,010 million.

Second, given the present basis of establishing levels for price support in our basic agricultural legislation, the Secretary of Agriculture is now required by law to raise price supports on the commodities so moved, as if the reduction in supplies had been the result of free-market exports rather than of virtual gifts abroad. Thus, we are faced with the ridiculous situation in which, as our surpluses are disposed of abroad with great difficulty and tremendous cost, we have a built-in device for refilling our storage bins.

Third, as Wilcox recognizes, we are antagonizing our competitors (notably Canada and Australia) in world markets. I understand that it has been estimated that, of U. S. "sales" to India for local currency, about one-third has represented displacement of food that would otherwise have been imported commercially. Despite our legal prohibitions to the contrary, such effects on commercial markets are inevitable and must weaken our friendly relations with other exporting nations of the free world. Of course, one can turn the aforementioned estimate around and say that two-thirds of our local-currency sales to India represented an increase in its food consumption, hence by and large contributed to human welfare and economic development. However, even this conclusion is not as simple as it seems, so long as India's Malthusian pattern of population growth prevails, so long as such "gifts" of food are not put on an assured long-term basis, and so long as India's inadequate commodity-distribution system prevents getting food to those places where it is most needed at any given time.

Finally, we should not overlook the longer-term deterrent effects of our "gifts" of food and fibers upon the agricultural development of underdeveloped countries. Such surplus foods may be valuable in improving human nutrition and productivity. However, they may also serve to lower significantly the market prices of particular staple products in the recipient country. The longer-run results may be the prevention of much-needed expansion in that country's agricultural output (e.g., of fats and oils in Spain); the disruption of normal and economical trading patterns based upon geographical contiguity (e.g., Brazilian wheat imports from Argentina); and the strengthening of restrictionist forces in the United States when our subsidized agricultural exports return as manufactured goods (e.g., as Japanese textiles) to undercut our domestic industry. Thus, in the long run, such bilateral agreements as Public Law 480 envisages are likely to harm the recipient country, our allies of the free world, and even ourselves, while seriously interfering with the achievement of a more nearly optimum allocation of world resources.

Nor do ingenious multilateral proposals avoid these difficulties. For example, the proposal has been made that we "give" cotton to Japan, which would in turn sell low-cost textiles to Indonesia, which would then pay the United States in its local currency. This program might avoid the embarrassment of so many low-cost Japanese textiles returning to our own doorstep, and might represent a net addition to Indonesian (and world) textile consumption. But it would also be very wasteful of our own public funds, would antagonize other major textile-exporting nations, and would discourage the development of domestic production in Indonesia of cotton and cotton-textile industries, which are probably best suited for its present low stage of economic development.

Of course, the reduction or elimination of our own farm price supports would also for a time create difficulties for our allies who export the same commodities and would discourage the expansion of agricultural production and processing in some underdeveloped countries, perhaps to an even greater extent than present PL 480 arrangements. However, it would encourage an allocation of both U. S. and world resources more nearly on the basis of true comparative costs, so that a sounder and more stable world pattern of production and trade could be established. At the same time, as American agricultural adjustments lowered the exorbitant costs to the public treasury of present price-support programs, more public funds would be freed for direct dollar grants and loans to underdeveloped countries, not to mention our own underdeveloped Southern region. Under such circumstances, our at best limited foreign economic assistance could make its greatest contribution to world economic development.

Turning briefly to the longer-run situation, I particularly liked Wilcox's statement that, far more important than the export of American farm products in the century ahead, "the export of American agricultural technology and technologists may prove to be agriculture's greatest role in world affairs." I believe that he is absolutely right. If the United States is to fulfill this vital role to the greatest possible extent, however, the American system of higher education—and particularly its land-grant colleges—bear a heavy responsibility.

In the underdeveloped countries, with their large labor forces and very scarce capital resources—particularly where a pattern of small-scale peasant landholdings has long been established—American agricultural technology can be adopted only after careful and often drastic alterations. Too often, our American agricultural experts have lacked the mental flexibility needed to recognize the unwisdom of attempting to pour the vastly different economic and social ingredients of the underdeveloped country into the American mold. (The American-sponsored

overmechanization of Turkish agriculture is a case in point.) If our agricultural institutions are to avoid this serious shortcoming in training both American and foreign students for service abroad, they need to give more emphasis to the organization and methods of American agricultural research and extension and less to the particular results found suitable to our own physical, economic, and social environment. To a large extent at least, the organization and methods are broadly transferable while the research results are not.

Second, whatever their specialty, American technologists abroad need to have some understanding of the nature of the broad problem of economic development and the relationship of their specialty to it. As a member of the International Bank's 1950 Turkish Mission, I had the privilege of knowing two such experts, one a British public-health specialist, the other a Canadian agronomist. The first expert was critical of a Turkish law that sought to control malaria by forbidding rice production within 3 kilometers of a village, thereby seriously diminishing the volume of rice produced. With a wisdom beyond his specialty, this public-health expert proposed other methods of malaria control that would not interfere with rice production. The second expert, former Dean of Agriculture, L. E. Kirk, of the University of Saskatchewan, recognized the importance of increasing productivity in Turkish wheat production despite the typically small peasant landholdings.

On the basis of a ten-year experiment in western Canada, Dr. Kirk proposed investigation in Turkey of the possibility of substituting a cereal row crop for fallow in its two-year dry-farming rotation. The Canada experiment has indicated that if wheat is handled as a row crop, more than half a crop can be produced in the fallow year without appreciably reducing the yield of the succeeding crop. Furthermore, as a row crop, the wheat can survive droughts that would bring complete crop failure to the regular crop. Given Canada's relatively scarce labor resources, the results of this experiment had not been put to any practical use there. But, to Dr. Kirk's credit, he recognized the very different conditions in Turkey—the dependence of the peasant upon a few acres of wheat for his family's subsistence under very hazardous weather conditions, the surplus family labor supply (especially between seeding and harvesting), and the heavy weed crop that stole most of the moisture during the fallow year anyway. Thus, he envisaged the possibility of using the surplus labor to hoe the row-crop wheat and possibly increase the smallholding's output by as much as 50 percent.

Both of these men represent the type of broadly based men of sound judgment that the land-grant colleges should seek to train for service abroad. Unfortunately, such men are not normally available for foreign

service on a career basis, usually being retired or on leave from some other responsible position. Far too often, American agricultural specialists abroad represent our least capable personnel or, even though capable in some special field, lack the training and perspective required by the top administrative positions they sometimes hold in the host country.

In my opinion, this problem of a shortage of well-trained American agricultural technologists for foreign service needs to be met head-on by at least some of the leading land-grant colleges. That is, we need in this country some agricultural training programs directed at preparing young Americans specifically for careers in foreign technical assistance, with broader curricula which include special courses in the social sciences and foreign languages. At the same time, the federal government must make its foreign-service positions more attractive in terms of salaries and perquisites and continuity and security of tenure if it is to be able to recruit more of our most capable college graduates. Only by such a two-pronged attack on this personnel problem can the United States adequately fulfill its obligation to help the underdeveloped countries of the world solve their food and agricultural problems in ways consistent with general and cumulative economic progress.

## IMPACT OF THE SOIL BANK

Chairman: T. R. Timm, Texas A. and M. College

### IMPACT OF THE ACREAGE RESERVE ON RESOURCE ADJUSTMENTS IN AGRICULTURE\*

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**E**VER since the beginning of the 1920's, with the exception of the period dominated by World War II, farm surpluses have characterized the American agricultural scene. Agricultural supplies have been at such levels during this period that they would not move in the free market at prices generally acceptable to the people of this country as expressed many times through actions taken by the federal government.

This paper will attempt to cover the following areas: (1) considerations involved in any market expansion or production control program; (2) the magnitude of the land resource adjustment necessary; (3) the operation of the acreage reserve program; (4) the accomplishment to date of the acreage reserve program; and (5) the requirements of an effective soil bank program.

#### *Problems Involved in Any Program for Balancing Supply and Demand*

Lest you feel that the writer is operating under any illusions in regard to the possible long-run accomplishments of an acreage reserve program, the writer wishes in the beginning to acknowledge certain considerations in attempting to improve per capita farm income by any adjustment program modifying either the supply or the demand of farm products. In the long run, all proposals to improve per capita farm income by raising farm prices above competitive levels in our dynamic society and within our general economic framework tend to be self-defeating. In the short run effective price programs may turn the terms of trade in favor of agriculture in such a way that the per capita income can be raised.

Because most proposed solutions through market expansion have been of a long-run nature, emphasis has continued to be placed upon adjusting output. Until the passage of the Soil Bank Act in May, 1956, most of the previous curtailment programs emphasized direct controls on individual crops. The soil bank attempts to obtain adjustment by individual voluntary action through the use of payments for shifting land out of cotton, tobacco and grain crops into the soil bank.

\* Journal Paper 1159, Purdue Agricultural Experiment Station.



The land resources as measured by plowland devoted to agricultural production has increased only slightly since 1920. Most increases in agricultural production since that date have come from the application of additional technology, capital and management. Most technology that has reduced unit costs has also increased supply. Thus, agricultural output increased in the '20's, in the '30's, in the '40's and is increasing in the '50's. Any market expansion programs that improve the price relationships for agriculture must expand the market at a faster rate than supplies are being increased by technology. Likewise, any control program to be effective must more than offset this continuing expansion of agricultural production arising from the adoption of new technology. It is not a matter of starting off from a stable agricultural production, but one of getting and keeping supplies and demand in balance. This is difficult because we have an almost irresistibly expanding supply base and also an increasing demand at home because of the expanding population.

In attempting to curtail output through bringing about adjustments in any of the three resources of land, capital and labor-management, certain problems are encountered. In adjusting and limiting the resource of land, output may be limited if the program is effective and, as a result, the per capita income of workers in agriculture may be temporarily raised. However, over the longer run these gains tend to be capitalized into the price of land or to result in more people and capital staying or being drawn into agriculture. If more people stay in agriculture, the per capita income is reduced. Considerable evidence is available of how gains from past programs have tended to be capitalized into land. This is particularly clear in tobacco.

If the capital resource is limited, economic theory would indicate that here again gains might be made in the short run but over the long run they would again tend to be capitalized into land or to result in more individuals being drawn into farming.

If the labor-management resource is limited, then the gains might be retained by the operators and the workers in agriculture. This, however, would require the setting up of boards that would limit or ration the right to farm. The limiting of entry into farming conflicts with our basic values. It has not even been seriously proposed as a solution. We have attempted to encourage shifts of a voluntary basis. The current Rural Development Program is partially directed toward this end.

Farm price programs, however, can be of value to farmers. They can be very beneficial during periods when agricultural incomes are depressed. They can speed up needed economic adjustments. Farmers can gain considerably in the short run and to some degree over the long run from certain types of price-raising programs.

A second hurdle to programs directed at improving farm prices is the difficulty of developing, passing and administering any objective farm program in the political environment that prevails. Perhaps someday greater understanding on the part of the public of the issues and techniques for administering such programs that give greater isolation from political pressures will aid in overcoming this problem.

### *The Problem*

Since 1952 the United States agricultural plant has been geared to produce four to six percent more total agricultural products than the market would take at generally acceptable prices. Without adjusting the aggregate supply, we attempted to maintain more acceptable prices than would have prevailed in the free market during this period. The result was large storage holdings by the U. S. Department of Agriculture even with heavy subsidized disposal programs.

Most agricultural writers for many years have recognized that agriculture in total has an inelastic demand. Most current studies in this area indicate an aggregate price elasticity of demand for farm products in this country of somewhere around  $-.25$ .<sup>1</sup> This means a change of one percent in supply results in roughly a change of four per cent in price. Therefore, farmers as a group have been subject to extreme fluctuations in prices when either supplies or demand changed quickly. During the recent period prices have been severely depressed with only a moderate excess supply. The problem, therefore, has been to reduce the supply four to six percent and then allow it to increase with the expanding demand from our increasing population and better diets.

Looking at the supply side, the United States has a total land area of approximately 1,904 million acres. Of this we have approximately 450 million acres in plowland.<sup>2</sup> Approximately 150 million acres of this plowland have been in hay, pasture crops and fallow. The remaining 300 million acres of plowland is in other crops, idle and failure. In addition to the plowland, approximately 965 million acres are permanently used for pasture and hay. The problem, therefore, to bring about this adjustment of four to six percent in supply involves shifting (if the soil bank approach is used) 30 to 50 million acres, or 10 to 17 percent of the plowland other than hay out of cotton, tobacco and the grain crops in order to get an adjustment in output of four to six percent. For a soil bank program to be effective this was the adjustment involved. The question might be raised why a 10 to 17 percent adjustment was required to obtain a four to six percent adjustment in supply.

<sup>1</sup> T. W. Schultz, *The Economic Organization of Agriculture*, McGraw-Hill Company, 1953, Chapter 5.

<sup>2</sup> U. S. *Census of Agriculture*, 1954.

First, grass, legumes and fallow are, to a certain extent, complementary in crop production. Some increase in the acreage devoted to these uses on many farms will increase the total quantity of grain produced if the land is rotated. Preliminary research studies at Purdue indicate that increasing these acreages of grass and fallow by ten percent (15 million acres) would not reduce total production if the roughages produced on the grass acreages were used by livestock.<sup>3</sup> If they are not used, something like an adjustment of ten million acres would still be required before any reduction would show up if the land were rotated.

Second, we can expect that new farm know-how will continue to be applied in agriculture with or without a soil bank program. Therefore, if agricultural production is reduced, additional acres of harvested crops will have to be shifted to grass and fallow to offset this. Perhaps five million acres will have to be shifted to the soil bank to equal the additions coming from new technology in an average year.

Third, the acres with yields lower than average will be shifted into the soil bank. Since there is always some slack in establishing bases and compliances, another five to ten million acres will have to be shifted before any reduction is realized.

Thus, we might have a soil bank of 25 to 30 million acres and still not see any noticeable effect on aggregate production; but a further shift of 10 to 15 million acres out of the non-roughage crops might provide a significant adjustment in total agricultural supplies. Thus, the job of the acreage reserve and the conservation reserve, if they are to be effective, is to shift 30 to 50 million acres out of cotton and grain crops into the soil bank. This is the problem to be met by any effective program that attempts to solve the problem by modifying use of the land resource.

### *The Acreage Reserve Program*

The Soil Bank Act of May 1956 is the latest over-all effort to limit output. It proposes to do so by limiting the use of the resource of land. The soil bank approaches the problem from two angles—an acreage reserve and a conservation reserve. This paper is confined to an appraisal of the acreage reserve phase. The acreage reserve was a temporary program designed to cover the four years, 1956-59, inclusive; and to reduce the production of the so-called six basic crops in excessive supply and thereby raise the price of these crops. The second objective of the program was to increase farm conservation by promoting new patterns of conservation work leading to better use of natural resources and the building up of seriously eroded land. A third objective was to use it as a vehicle to dis-

<sup>3</sup> J. O. Dunbar, "An appraisal of National Forage and Livestock Incentive Programs for Adding Stability to Farm Incomes," Unpublished Ph.D. thesis, Purdue University, January, 1954.

tribute money to farmers at a time when there was great political pressure to do something about agricultural incomes.

The 1956 acreage reserve program was operative on the six basic crops. The 1957 program omitted peanuts and extra-long-staple cotton which were not considered in surplus. Thus, the only crops included in 1957 were wheat, upland cotton, corn, tobacco and rice.<sup>4</sup>

Under the program the participant signs a one-year contract with his ASC Committee in which he agrees to reduce the acreage of a basic crop below the number of acres allowed him under the allotment and soil bank program. For each acre thus reduced below the allotment he receives a payment from the government which is intended to be large enough to at least compensate him for any loss of income on that acre of land.

The individual farm payment is determined by multiplying the base unit rate of the crop limited by its normal yield per acre and then by the number of acres a farmer has volunteered for the program. The program was put into operation so late in the year 1956 that it was not operative in any significant manner except in the drouth and floor areas. In 1957 the national base-unit rate of payment for wheat was \$1.20 per bushel, cotton 15¢, corn 90¢, rice \$2.25 and tobacco on the average approximately 17.6¢.

Initial limits on the number of acres the farmer could put in the program in 1957 were established to give an opportunity for a large number of farmers to participate. In certain instances, farmers were able to exceed the initial upper limits by reallocation of unused funds from other counties and states.

For the 1957 crop year \$750 million was made available for payments to farmers who put land in the acreage reserve. The amount of \$268 million was allotted to wheat, \$217 million to cotton, \$217 million to corn, \$14 million to rice and \$34 million to tobacco.

#### *An Appraisal of the Soil Bank Program*

The acreage reserve program did not become available until late in the 1956 planting season. The first year of operation resulted in 12.3 million acres being put in the acreage reserve program. This participation included corn, 5,450,000 acres; wheat, 5,654,000 acres; cotton, 1,113,000 acres; peanuts, 43,645 acres; rice, 28,003 acres and tobacco, 31,671 acres.

Much of this land that went into the soil bank in 1956 was land in the drouth sections of the country. Thus, the reduction from the program was only minor as compared with what the reduction would have been without a program. Total farm output was actually one index point higher in 1956 than in 1955.

In 1957 approximately 20 million acres were put into the acreage re-

<sup>4</sup> *The Soil Bank Program for 1957*, U.S.D.A., February, 1957.

serve. This consisted of 12.8 million acres of wheat; 4.5 million acres of corn; 3 million acres of cotton; 204,000 acres of rice and 80,000 acres of tobacco. In addition, nearly 7 million acres were put in the conservation reserve making a total acreage taken out of crops of 27 million acres. However, the July 1, 1957 crop production reports show the five basic crops reduced only 16 million acres below 1955, while the acres of other cultivated and grain crops were up 4.5 million acres. This was a net reduction of only 11.5 million acres in all cotton, tobacco and grain crops as compared with the 27 million acres put into the soil bank.

The acreage reserve program did not set up a total crop base of cotton, tobacco and grain for the farm and this resulted in each farmer substituting his next most profitable crop for the crop reduced, taking his idle acres from the least profitable land on the farm. In the areas, for example, where summer fallow is practiced, the soil bank acres were taken out on summer fallow and in many cases barley or some other crop was substituted for wheat making it unnecessary to reduce the total grain crops in these areas. In the Corn Belt soybeans were substituted for corn and in the hard winter wheat areas sorghums replaced wheat.

Wheat, cotton, rice and tobacco producers were already at their allotments because of the mandatory features of the control and support programs for these crops. Therefore, they were eligible for acreage reserve payments without further adjustment. In the case of the corn producers, a low percentage planned to stay within their allotments with the corn acreage allotment and support program being optional. Therefore, corn producers who wished to go into the acreage reserve program had to make a substantial adjustment in order to get within their allotment and be eligible for any acreage reserve payments. Data from an interregional soil bank study<sup>5</sup> in the grain and livestock areas of central Indiana indicated that producers would have had to reduce their corn acreages by 36 percent from their normal or planned acreage in order to stay within their allotments in 1957. Since much of the corn is grown on livestock farms where it is fed, there appeared little advantage to the producer to make the first adjustment to his allotment.

This same study indicated that 1957 acreage reserve payments on corn were sufficient in this area to obtain some participation from approximately 50 percent of the producers if the payments started at their normal acreage of corn. Under the 1957 acreage reserve program participation was actually only 15 percent for this group of farms. The farmers who did participate in the acreage reserve in this area tended to be smaller than average and more of them worked off the farm or had reached retirement age than average. Approximately one-third of those who participated placed all of their corn allotment acreage in the acreage reserve. In this



area this would indicate that the program encouraged the small farmer to withdraw from farming instead of encouraging him to stay in farming.

In summary the 1956 and 1957 acreage reserve programs have not been effective in materially reducing the agricultural output. Neither has the program been fully effective in distributing the funds appropriated for this purpose. We may have about a 11.5 million acre reduction in cultivated and grain crops in 1957 from the 1955 levels as a result of both the acreage and conservation reserve. This should have some modest effect upon production. Since this reduction has been made on the lower-producing acres, however, and some of it must also be credited to the conservation reserve, it is evident that the acreage reserve with normal weather will not make a substantial reduction in our surplus. A program with the level of payments a little higher and with the soil base acreage for the cultivated and grain crops covering the entire farm, as was used with the conservation reserve, would have been more effective. In the Corn Belt, the reduction of the allotment in the commercial corn areas to 37 million acres, likewise decreased participation substantially.

#### *Requirements of An Effective Soil Bank*

Payments large enough and administered so that some 30 to 50 million acres will be shifted from grain crops and cotton to grasses, legumes, fallow and trees is required to achieve the objectives sought. Programs that simply bring about shifts from one grain crop to another achieve little reduction in output. Also a soil bank program cannot adjust production if it is used primarily as a relief program for crop disaster. This means merely an increase in the total acreage in grass and fallow at the expense of the total acreage in cotton, tobacco and grain.

Let us first look at the question of rate of payment for an effective acreage reserve. In 1957, the rate of payment was approximately 60 percent of the gross value of the crop for wheat and corn, 50 percent for cotton, and 40 percent for tobacco. The interregional study<sup>5</sup> made in the wheat, corn, cotton and tobacco areas indicated that this rate would need to be 10 to 15 percentage points higher in each case to obtain the cooperation of  $\frac{1}{2}$  to  $\frac{3}{4}$  of the producers. The cost of obtaining 100 percent participation would be higher as there was considerable range in the rates of payments individual farmers felt they needed to make the adjustment. Many farmers expressed a desire to place their entire acreage in the acreage reserve. The placing of the entire acreage in the soil bank enables the farmer to shift not only his land resource, but also his other resources. The reduction of variable costs due to a partial shifting of the land re-

<sup>5</sup>IR Project 881, Unpublished data, Agricultural Experiment Station, Purdue University.

source is only a small part of a farmer's total costs. He could shift for considerably less payment under a program that would allow him to put in his whole farm.

The 20 million acres obtained this year is not sufficient to bring about the adjustment necessary. The acreage reserve obtained this year was increased substantially by two factors. First, a sizeable proportion of the acreage reserve came from the states where the drouth was severe in 1956 and the early 1957 prospects were poor. Secondly, the acreage reserve was augmented in those areas where barley or some other grain crop could be substituted for wheat with the reserve acres taken out of fallow. Likewise, a considerable portion of the land put in the soil bank came from cultivated grassland and idle acres.

If no control and price support program were in operation for these crops and 50 million acres were taken out of the five crops of wheat, corn, cotton, tobacco and rice at the higher payments indicated, such a program might cost between \$1.5 and \$2 billion.

From the standpoint of requirements, the base for grain and cultivated crops should be established for each farm such as in the conservation reserve program this year or as recently announced by the U. S. Department of Agriculture in connection with the 1958 program. Any adjustment in these five crops would then mean a corresponding adjustment in base acres in all grain and cultivated crops. The land might be placed in grass, remain idle, in fallow or in trees.

Such a program as this would distribute the payments throughout the states in about the same proportion as the value of the crops grown in the various states. Cooperation no doubt would still be heaviest in the areas where these crops were contracting and least in the areas where they were expanding. This was evident this year particularly in the case of cotton. The higher participation was in the old cotton-growing areas of the southeastern states and least in the midsouth and western states. Another requirement for a program to be effective is that the program must be explained to farmers before they have purchased their seed and fertilizer and completed their plans for the next year's crop.

If a program were to be used for taking out the acres in the marginal or high-cost grain-producing areas more along the lines of the present conservation reserve program, a similar adjustment could be obtained at a savings of about one-half billion dollars. Such a program, in addition to requiring lower government payments, would be more in line with the long-time economic national welfare, although it might be less acceptable politically. It would tend to concentrate the reduction and the payments in high-cost crop-producing areas. The low-cost producing areas would make less adjustment and would receive their gains through higher production

and higher prices resulting from the decreased production in high-cost areas. Economic analyses show that it costs more to get a farmer to shift one acre of 50-bushel corn land into grass than it does to get a farmer to shift two acres of 25-bushel corn land into grass. With the 50-bushel corn land the margin of return above operating costs tends to be more than on the two acres of high-cost land. This is true for the other crops, too.

Some have proposed that the government rent a certain percentage of the 450 million acres of plowland. The farmer would then be allowed to grow whatever he desired on the remaining acreage. This proposal has the advantage of getting away from historical bases. In the interregional study, we are attempting to analyze the consequences of such a program. Others have gone so far as to propose outright purchase of land in certain areas.

The question may be raised, "If agriculture were to be brought into balance by an acreage reserve program, where would it end? Will technology make it necessary to have an ever-enlarging acreage reserve program with a growing cost to the federal government? Or will demand catch up with supplies and make it possible to release the acreage reserve acres back into production?"

The balance of evidence indicates that the withdrawal problem is likely to be a serious one. For this reason, making the payments to areas that can most economically shift to grass might be the most economically sound. Eventually, the grass might be used and eventually the payments might be reduced or withdrawn without too much of the land shifting back with peacetime prices to grain crops.

Studies in the Corn Belt indicate that if corn land is shifted to grass and the grass is pastured, about  $\frac{1}{2}$  to  $\frac{3}{4}$  as much reduction can be obtained by pasturing the shifted land as by keeping it idle. Studies in the Great Plains area also show about  $\frac{1}{2}$  as much reduction if acreages shifted from grain crops to grass crops were pastured. Here again, the interregional soil bank study indicates that the cost of a program where the grass was used would be nearly the same as the cost of a program where the grass was not used. Obviously, more acres would have to be shifted to grass to obtain the adjustment, but farmers indicated their willingness to shift them to grass at a substantially lower figure if they could use the grass.

If the grass in the soil bank were used, it would increase dairy and sheep production slightly, but the increase would come mostly in beef production. Beef supplies would increase perhaps by ten percent if the program were successful, but total meat supplies would decrease. Therefore, beef producers would benefit from the reduced supplies of competing pork and poultry products. Poultry and pork producers would lose some of their market to beef producers and beef prices would rise less than pork and poultry prices.

A question often posed in connection with making the soil bank effective is, "Would farmers under an acreage reserve program apply more capital and labor in the form of fertilizer and in other ways and offset the adjustment resulting from the reduced acres in grain crops?" This may be true over the longer run if farm incomes are kept high or if grain prices are kept high by the program, but in the very short run this may be overemphasized. In the central grain and livestock area of Indiana, the fertilizer use on 68 farms in the acreage reserve program in 1957 was compared with the fertilizer use on 68 matched farms not in the acreage reserve. Statistical analysis shows no difference in the amount of fertilizer used per acre in the two groups of farms. A study made in Indiana in 1955, comparing fertilizer use on farms in the corn control program and those not in the program, gave similar results. Paulsen, Heady and Baumann<sup>6</sup> at Iowa State College, on the other hand, found that those farmers who complied with their corn acreage allotments increased fertilizer use more than those who did not comply with acreage allotments. Practices vary among areas. However, I think the differences in fertilizer use are over emphasized for any given year or two within the limits with which prices might be changed.

Much is often made of the point that farmers would leave the farm less rapidly under an acreage reserve program that raised farm prices. Here again many factors come into play in connection with the movement of people from rural areas. Much higher farm prices would be a deterrent, but the movement rests not alone on prices, but also on the opportunities off the farm and on the land resources available. The soil bank would not change the opportunities and there would be less land resources available.

### *Summary*

To make a soil bank program effective in achieving the assumed price objective involves a shift of 30 to 50 million acres out of cotton, tobacco and grain crops. The 1956 and 1957 program did not accomplish this objective. Payments per acre for shifting land were too low. The program was presented to producers too late in the season. Too many concessions were made in the requirements. In the Corn Belt corn allotments that were too low handicapped the program.

A soil bank properly conceived and reasonably free from political pressure could reduce, at least temporarily, the supplies of agricultural products. If political pressures can be minimized, there is much evidence that the acreage reserve should be directed most heavily at shifting crops out of the high-cost grain producing areas where grass and timber can most effectively compete in the long run.

<sup>6</sup> Arnold Paulsen, Earl O. Heady and R. V. Baumann, "What Can Corn Allotments and Soil Bank Do," *Iowa Farm Science*, Vol. 12, No. 2.

If a market cannot be found for our expanding supplies of farm products and if free economic forces are allowed to work, some of our high-cost grain-producing areas will go back to grass and timber. The movement of human resources out of agriculture alone is not enough to bring supply and demand into better balance. An intelligent and properly administered acreage reserve or conservation reserve program, which speeds up this adjustment, can ease the pain of the adjustment for all farmers. In developing farm programs in our dynamic economy the adjustments that the economic forces are bringing about should be recognized and farm programs should be developed to facilitate these adjustments rather than to retard or to maintain the *status quo*.

#### DISCUSSION: IMPACT OF THE ACREAGE RESERVE ON RESOURCE ADJUSTMENTS IN AGRICULTURE

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The first part of Professor Bottum's paper is a brief review primarily of the procedures involved in operating the acreage reserve part of the soil bank. This information will be more useful for general reference in the *Journal* than in the scattered USDA mimeographs.

One comment on this early part of his paper is appropriate. He says "In the long run, all proposals to improve per capita farm income by raising farm prices above competitive levels in our dynamic society and within our general economic framework tend to be self-defeating." Here it appears that Bottum really means the political framework, that is, he assumes that societal decision makers are unwilling to accept sufficiently drastic procedures for curtailing inputs and stimulating migration out of agriculture.

If Bottum means that economic adjustments always will put pressures on the controls used, then there is no argument. If however he means that no system of controls and inducements is possible that will keep farm prices above competitive levels in the long run, then there is room for disagreement. He suggests that the licensing of the entry into agriculture is politically unacceptable. The other side of the coin—stimulating the exit—is more feasible, although not easy.

Both Bottum and the public at large think of production controls largely as controls over the land input. Land is becoming less important as a factor of production, while fertilizer, chemicals, improved strains of crops and livestock, supplemental irrigation and especially the skill and ability



of the farm operators have become far more important. No serious control program can be effective without taking account of these inputs. I believe that induced migration out of agriculture combined with controls over total inputs could be worked out with no more variance with our general *economic* framework than at present. However, the *political* implications of controlling the sales of fertilizer and chemical companies or the output of the Extension Service cannot be treated lightly, either with respect to the welfare of these companies and institutions, or with respect to the effect of rationing procedures on the welfare of different sizes of farms and different segments of agriculture. I suspect that all things considered, we ought to look at output control a lot more seriously.

In one respect at least the adjustment of agricultural production in the short run and intermediate run is far more difficult than in the long run. The number of people who can leave agriculture without reducing production is so large and their age distribution is such that a long period of time will be required before significant adjustments in the supply-demand balance are attained. However, an improvement in per capita incomes would occur earlier, unless production actually increased with a reduction in the number of farms, as is possible in some areas.

In a later part of his paper Bottum suggests that only 15 percent of the farmers in one group in central Indiana participated in the acreage reserve. This year in studying commercial farmers growing wheat in southern Michigan we found a 30-percent participation. This study corroborates Bottum's conclusions that smaller farmers and part-time farmers were more likely to participate. The differences in size were not significant, 217 acres for participants and 236 acres for nonparticipants. Only 55 percent of the participants obtained three-fourths or more of their income from agriculture, compared with 73 percent of the nonparticipants who obtained this proportion of income from agriculture. However, contrary to our expectations and to Bottum's conclusions, there was no relationship between age and participation. In fact, only eight percent of the participants were over 65 compared with 12 percent for the nonparticipants.

An earlier study in Michigan indicates that wheat farmers did apply more fertilizer as they adjusted to acreage controls and marketing quotas while corn farmers did not.<sup>1</sup> We have interpreted this to mean that when drastic adjustments are forced on farmers by compulsory reductions in acreage they are more likely to reevaluate their entire pattern of practices and operations. Under these circumstances new technology is used to offset smaller wheat acreages. In the case of corn, where participation was more convenient and accidental, no such reevaluation of their practices

<sup>1</sup> Myron E. Wirth, "Production Responses to Agricultural Controls in Four Michigan Farming Acres in 1954," Unpublished Master's thesis, 1956.

on corn was made. Both participants and nonparticipants made the same increases in fertilizer use on corn.

As I read Bottum's evaluation of the acreage reserve, we have bought very little adjustment with expenditures of more than a billion dollars in 1956 and 1957. We still have large CCC stocks, and face large expenditures in disposing of surpluses in domestic and overseas outlets. He suggests that by spending about three times as much we would attain some temporary adjustment either through smaller payments grading down land use on many acres or through larger payments to bring in some additional acreage. However, after some three to five years it probably would be necessary to further increase the number of diverted acres to more than 50 million. In this respect the House of Representatives appears more willing than economists to recognize when a program is a failure. On the other hand Congress appears to be sticking to controls via the land resource much past the period when the weaknesses of this approach are manifest.

The listed costs of the CCC combined with soil bank payments, Public Law 480 sales for foreign currency, ASC payments, and payments on wool, sugar, and under the International Wheat Agreement came to more than \$4 billion dollars in 1957. Recent votes in the House suggest that the split in agriculture's political objectives and the minority position of agriculture are coming to the fore. With a (perhaps temporary) deflation of agriculture's political position, new alternatives are possible, in fact essential. Have agricultural economists anything to contribute by way of more adjustments at less cost?

Bottum pointed out that one objective was to provide an income supplement at a time when agricultural incomes were declining relative to the rest of society. I agree that this was an important objective. Not so clear is the specific nature of the desired redistribution. He does not deal further with this problem except to suggest that the acreage reserve should not be used as a relief program for crop disaster. By utilizing the criteria for income distribution commonly applied in our society, a redistribution from rich to poor, the program may be slightly better than the loan and storage program, in that smaller farmers and farmers under pressure to take off-farm work are more likely to participate. I doubt that we can justify the 1956 and 1957 programs on the basis of its possibly slightly better distribution of income within agriculture compared with other programs.

Bottum is ambiguous with regard to the part-time farmer. In one place he suggests that the program encouraged small farmers to withdraw from farming. Toward the end of his paper he cites the argument that if the acreage reserve stimulated higher farm prices (which apparently has not

occurred) it would discourage off-farm migration. But he also points out that the soil bank limits acreage although off-farm opportunities are not affected. Hence the inference is for a slight stimulation of migration. Is it not possible to be more positive? The combination of some income security via soil bank payments combined with a smaller work load on the farm should encourage farmers to work more off the farm where such opportunities are reasonably close. He indicates that a third of the Indiana farmers put all of their allotment in the acreage reserve. Our Michigan study indicates that more than half of the corn farmers did so. With the ceiling of \$3,000 on payments for 1958 there should still be ample opportunities for other small farmers to follow this procedure. Could the USDA make other changes in the rules that would further increase the shift from farming in areas with nearby industrial and service opportunities? If so, perhaps some of the half-billion dollars will be well spent.

## IMPACT OF THE CONSERVATION RESERVE ON RESOURCE ADJUSTMENTS IN AGRICULTURE\*

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**I**N PASSING the Agricultural Act of 1956, Congress authorized two new production control programs—the acreage reserve and the conservation reserve. The new legislation was prompted by the failure of existing control machinery to cope with the problem of general overproduction.

Corn acreage allotments proved ineffective in cutting feed output. Although marketing quotas reduced the production of wheat and cotton, they also increased the output of feed grains, flaxseed, soybeans and other crops. The correction in the "supply equals demand" balance for cotton and wheat spilled over into the feed-livestock economy, resulting in larger government stocks of feed grains and downward pressure on livestock prices. The diversion of 28 million acres from wheat and cotton made little or no dent in total farm output. Farm leaders took stock and concluded that agriculture was suffering from more than a maladjustment in the composition of farm production.

Under the appealing title of the soil bank, the new programs constitute the first postwar effort at general production control. As additions to, rather than substitutes for, other control machinery, they aim at reducing the total output of farm products. Like past control efforts, they depend on the rationing of land input for production effects.

### I

The conservation reserve is the longer-range part of the soil bank. It has a secondary objective of encouraging the conservation of soil, water, forest and wildlife resources. In contrast to the acreage reserve where participation is limited to producers with basic crop allotments, all farmers with eligible land can participate in the conservation reserve. Eligible land consists of all land other than land planted to fruit or nursery stock, land owned by the federal government, land under acreage reserve contract and land idle or used for permanent pasture. Annual payments are made for diverting eligible land to permanent cover for periods of 3, 5, and 10 years. In addition, payments for cost sharing are made to help defray the cost of establishing cover or building conservation structures.

A soil bank base is set for each farm. At the present time, this base is the average acreage planted to soil bank base crops in 1955 and 1956,

\* Journal paper No. J-3262 of the Iowa Agricultural and Home Economics Experiment Station, Ames, Iowa. Project No. 1134.

plus any land in the acreage reserve. Soil bank base crops consist of most harvested crops other than tame hay. By reducing the acreage of soil bank crops below the soil bank base, a farmer can earn annual rental payments at the diversion rate. The national average diversion rate for 1957 is \$10 per acre. Eligible land, other than that in soil bank base crops, can be placed in the conservation reserve also. But the annual rental rate on this land is only 30 percent of the diversion rate. A farmer with all eligible land can put his entire farm in the program. Cost sharing payments are made for 10 conservation practices, including 5 land-cover practices, 2 water-conservation measures and 3 wildlife-conservation practices.

## II

Partly because of congressional delays, the program got off to a late start in 1956. The national conservation reserve goal was set at a modest 4 to 6 million acres. The total area earning rental payments, however, reached less than 1.5 million acres. Slightly more than 16 thousand farms participated in the program. Total rental payments amounted to about \$12.4 million. Practice payments came to nearly \$0.8 million.

Greater familiarity with the program prompted an increase in participation in 1957. As of April 30, this year, 15 days after the close of the period for contract signing, some 85 thousand farmers had agreed to put land in the conservation reserve. Although this was a six-fold increase over 1956, still only about 1 farmer out of 50 was in the program.

During the current year about 6.8 million acres are covered by conservation reserve contracts. This is about one-third of the announced goal of 20 million acres for 1957. The total annual payment on this acreage is estimated to reach nearly \$60 million. Total practice obligations amount to about \$64 million.

Most of the land in the program is under contract for 5 years. Nearly 95 percent of the land was taken out of soil bank base crops. The remaining 6 percent consists of other eligible land. About 12.5 thousand farms have all eligible acres under contract. This land makes up about 16 percent of the total land in the program.

## III

During its first two years of operation, the conservation reserve has had little effect on the total output of farm products. In 1956 an amount equivalent to about three-tenths of 1 percent of the nation's cropland was diverted from current production by the program. The figure for 1957 was about 1.5 percent. However, the total output effect probably has been substantially less than suggested by these figures.

Most of the land placed in the conservation reserve appears to have



been below average in quality. Annual rental rates apparently have been high enough to induce some of the poorer quality land into the program. They have not been high enough to attract the better quality land away from current production. Some tendency exists for participation to be higher in the areas with relatively large amounts of poorer quality land. More than one-fourth of the cropland in New Mexico is under contract. Colorado and Utah have close to 4 percent. On the other hand, less than three-tenths of 1 percent of the cropland in Iowa, Illinois and Indiana is under contract.

In addition, any intensification effect on participating farms would tend to reduce output less than in proportion to the decline in cropland. Some of the other control programs have induced an increase in the ratios of labor and capital to land with the result that output per acre increased. Some important differences exist, however, between the conservation reserve and these programs. Empirical studies of program experience are needed. Without these, one can only theorize on the basis of reasonable assumptions.

If a farmer contracts to place land in the conservation reserve, he foregoes the opportunity of earning income from the sale of products from this land. For this, he is paid an annual rent. The labor and capital previously applied to this land become available for use elsewhere. If these resources are applied to the nonprogram land, an intensification effect is induced. Output per unit of land input tends to rise. In this case, the marginal productivity of labor and capital falls below the preprogram level. The increase in output on nonprogram land is less than the decline in output on program land. In the absence of price changes, factor income from product sales may be expected to decline. However, the farm will experience an increase in total factor income if the conservation reserve payment exceeds the decline in income from sales. If this occurs, the farmer will find a contract profitable.

For an intensification effect to take place, the return to the labor and capital freed from program land must be greater when applied to nonprogram land than when put to other uses. Or, there must be other restrictions that encourage a higher ratio of labor and capital to land. As the marginal return to labor and capital diminishes, the incentive to obtain more land or to find nonfarm employment is increased. This could help to speed up the adjustment in farm size and the transfer of labor to nonfarm employments. Whether it would or not depends on other factors.

Although the incentive to obtain more land or to find nonfarm employment is increased on participating farms, an intensification effect is still likely. This is less likely, however, on owner-operated farms than on tenant-operated units. The owner-operator can bank all eligible land, quit

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farming and continue to receive conservation reserve payments. The tenant operator can share in these payments only if he continues to farm. This suggests a significant difference between the proportion of tenant-operated farms and owner-operated farms banking all eligible land. Furthermore, some landlords disapprove of the idea of having their tenant spend part of his time at nonfarm work. Because of the income effect, a landlord under a share lease would like to see all of the labor and capital applied to the nonprogram land. Also, lack of information and limited local employment opportunities are important restrictions on the transfer of resources in many areas. For these reasons, it seems likely that the program has induced some intensification effect on most participating farms, other than those banking all eligible land. Undoubtedly, this has helped to dampen the output effect of less land input.

Some of the farms banking all eligible land probably have gone out of existence as going concerns. The operators may have retired or taken jobs in town. The resulting decline in labor input, however, cannot be attributed entirely to the program. Likely in a number of these cases the decision to quit farming would have been made even without the program. The land would have been rented to another farmer instead of to the government. The program provided an unexpected increase in rental income. Undoubtedly, there have been instances, however, where the program effect was sufficient to tip the balance in favor of a decision to quit farming. The higher rent or the greater convenience offered by the program made the decision to quit more attractive. How frequently this may have occurred is not known.

The program probably has had some adverse effect on resource efficiency. The withdrawal of land from current production on participating farms has meant some fall in the net value of current output. This decline, plus the value of any resources used in establishing permanent cover, can be considered the cost of devoting this land to grass. Since the land has been in permanent cover rather than in harvested crops, the benefit consists of the discounted future value of any additional product that the land will produce in the future. Soil scientists say that this increase on many soil types will be small, especially after two or three years. After allowance is made for the effects of supports on present prices and considering the longer-run outlook for farm products, it seems highly unlikely that the benefit derived from this shift will cover the costs incurred. I suspect this will turn out to be an inefficient use of our land resource, not because the land was put in grass but largely because it was withdrawn from current production.

The program may also have had some small effect on labor and capital efficiency. On most participating farms there probably has been a reduc-

tion in the amount of labor and capital applied to the land placed under contract. With diminishing marginal returns, this would tend to make the marginal return to these resources higher on program land than on nonprogram land. On farms where there has been an intensification effect, there probably has been a decline in the marginal returns on nonprogram land because of the increase in the ratios of labor and capital to land. This tendency of marginal returns to widen between program and nonprogram land suggests some inefficiency in the allocation of labor and capital. The annual rental payment, however, has made this inefficiency profitable for participating farmers.

As a means of encouraging the transfer of labor and capital to nonfarm employments, the conservation reserve is relatively inefficient. Although it probably does provide some additional encouragement along this line, the same amount of money spent on rural education and on informational services undoubtedly could have done more. The program was not designed to be an efficient technique for moving resources out of agriculture. Insofar as it has induced a transfer it has been incidental and unplanned. The conservation reserve, however, is some improvement over other control programs in this respect. Also it does not involve the assignment of individual farm allotments or quotas. Consequently, there is less likelihood of it interfering with the composition of farm output and the pattern of interregional specialization.

#### IV

If the conservation reserve is to make a substantial dent in the output of farm products over the next several years, a greatly enlarged area of land will need to be brought under contract. This will require a sharp increase in rental payments. At present rental rates, the impact of the program on production and resource use will continue to be of minor quantitative importance.

In principle, there is no reason why farm output cannot be reduced by the rationing of land. If sufficient land of (say) average quality is withdrawn from current production, an output effect certainly can be produced. Because of intensification effects and the use of improved farm practices, the amount withdrawn has to be proportionately greater than the output effect desired. Yet, if Congress and the American people were willing to pay the necessary price, the program undoubtedly could reduce output enough to raise prices to 90 or 100 percent of parity.

The real question is whether or not it makes economic sense to reduce output by withdrawing land from current production. This approach to the problem of too much output assumes that the land factor is in excess supply. Therefore, less of it should be used. This implies that the marginal return on agricultural land is less in current agricultural uses than in the

use to which it will be put when not used in current farm production. It also implies that the marginal returns on labor and capital are higher in agricultural uses than in nonagricultural uses.

But this does not seem to fit the facts as best they can be gleaned. The available evidence suggests quite the contrary. It points to a lower marginal return on agricultural land in nonagricultural uses than in agricultural uses and higher return in current agricultural uses than in future agricultural uses. Furthermore, it points to a higher marginal return for labor and capital in nonagricultural uses than in agricultural uses.

To achieve a substantial reduction in the output of farm products by using less land would almost certainly mean that the residual output would not be produced in the cheapest possible manner. The land that would be released would have a relatively low marginal return in nonagricultural uses. Present indications are that for the foreseeable future the discounted value of any additional product resulting from permanent cover on the land withdrawn from current production would be less than the purchase cost, including the current value of the marginal product of this land.

Reducing output by withdrawing land would mean relatively little change in the amount of labor and capital in agriculture. In the period ahead, these resources are likely to have a relatively high marginal opportunity cost in farming. The marginal return for labor and capital in the rest of the economy is likely to continue relatively high. The probable result would be a total factor cost for farm output far in excess of the feasible minimum. To produce the residual output at minimum factor cost, what is needed is less of the factors with the highest marginal opportunity cost, i.e., labor and capital.

Undoubtedly, there is an appreciable area of agricultural land that needs to be put in grass from the standpoint of intertemporal allocative efficiency. The real income of the economy will be different, however, if this is achieved by means of a soil bank or by a program that makes for a more extensive agriculture by encouraging the transfer of labor and capital to the nonfarm economy. When land is placed in grass it normally means a reduction in the application of labor and capital. As long as these resources remain as abundant as they are in agriculture, the pressure will be to utilize land intensively. To get more land shifted to grass under these circumstances requires government coercion or subsidy. By encouraging a transfer of excess labor and capital to nonfarm employments, these resources will become scarcer in farming. It then will be profitable to move the typical cropping system in many areas toward more grass. At the same time, the resources released from agriculture can make a larger contribution to the national product.



## V

Much of the current discussion of adjustment needs in agriculture focuses on the excess supply of farm products. Insofar as output is above the long-run equilibrium level, some reduction will be needed to achieve an efficient use of resources and to provide comparable factor income opportunities in farming. As things stand, however, it is not clear how much of the difficulties in agriculture stem from overproduction. There is some question as to how large the excess supply really is.

All would not be well if farm prices average 90 or even 100 percent of parity. Such prices are no solution to what has become known as the poverty problem. This is partly an allocation problem and partly a problem of inadequate family resources. Insofar as it is an allocation problem, it is reflected in undersized farms employing outmoded technology, too little capital and too much labor. When resources on these units are priced on the basis of long-run opportunity cost, production charges per unit of output become extremely high. Even with prices at 100 percent of parity, factor incomes on such units are too small to pay resource returns comparable to what can be earned elsewhere in the economy.

Some agricultural economists have tended to identify this problem with places like the Southeast and the cut-over areas of the Lake States. Many have not considered it a serious problem in the more prosperous farming areas such as the Corn Belt and the Great Plains. One gathers that the commercial sector of agriculture is burdened almost exclusively with an excess supply of farm products.

The problem of excessive production costs is more serious in some regions than in others. But I suspect that it is far more important in commercial agriculture than is generally recognized. Likely a significant part of what is referred to as a problem of overproduction is in reality a problem of excessive factor cost.

Even in the best farming areas the present level of output is being produced at substantially higher resource costs than the best technology and factor combinations would permit. Because of this, the level of farm prices needed to induce comparable factor returns on many of the farms in these areas is appreciably above the long-run equilibrium level. In other words, if the long-run equilibrium level of output in agriculture were produced at minimum factor cost, comparable factor returns could be earned at a significantly lower level of farm prices. With high production costs on many farms, the maladjustment in the level of output takes on the appearance of being larger than it really is.

Preliminary results from a study underway in Iowa indicate that if Iowa's Class III, IV, V and VI commercial farms, based on 1954 Census definitions and data, had been reorganized and operated as Class II farms,



total output in the state would have been about 10 percent greater. The increase in output would have been achieved with about 20 percent fewer workers and with about 10 percent less capital. On a per farm basis, output would have been up about 65 percent. Capital input per farm would have been 30 percent larger. The number of workers per farm would have been 15 percent greater.

If 10 percent more total output could have been produced with 20 percent fewer workers, 10 percent less capital and the same input of land, the actual level of output could have been produced with even less labor and capital. Since there is reason to believe that Class II farms were not optimally organized, the possible savings in resources might have been, in fact, still greater.

The results strongly point to a serious problem of excessive factor cost. In Iowa a price level for farm products that would permit comparable returns on the best organized units would not permit comparable returns on the relatively large number of more poorly organized farms. If total farm output were reduced enough to raise prices sufficiently high for comparable returns on the majority of Iowa's commercial farms, factor returns on the best organized units would exceed comparable levels elsewhere in the economy.

Policy measures inducing a small increase in the rate of decline in farm numbers and labor force might actually aggravate the problem of too much output. Total output might be higher after a small reorganization of resources than before. A small reorganization might put more of the land under better managers using superior technology and lower-cost factor combinations. So total output might rise at the same time that the input of labor and capital declined. If a reorganization were to involve a large decline in labor and capital, the increase in output would not occur.

As agriculture is now organized, there are two important opportunities to save resources. The current level of output is being produced at a factor cost substantially higher than the feasible minimum. For the most part, this reflects the fact that the potential gains from past advances in farm technology are not being fully realized. Additional labor and probably some capital can be released to the nonfarm economy by producing the current level of output at a minimum factor cost. In addition, the current level of output is too large. A further saving in labor and capital can be achieved by reducing farm production to the long-run equilibrium level. In large measure, this mirrors the fact that too much of the gains from past improvements in farm technology are being taken in the form of more farm output; not enough are being taken in the form of nonfarm output through the release of resources from agriculture.

The great challenge to our generation of agricultural economists is to discover how these savings can be transformed into real income. This is essential if people in general are to receive the full benefits of better farm technology and if farm people in particular are to participate in income growth on equal terms with other people.

### DISCUSSION: IMPACT OF THE CONSERVATION RESERVE ON RESOURCE ADJUSTMENTS IN AGRICULTURE

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Kaldor has outlined the essential features of the soil bank and especially the conservation reserve. He has assessed the impacts on production and resource adjustments in agriculture. In his opinion conservation banking is the wrong way to achieve adjustments in agriculture since it fails to give much encouragement to the transfer of labor and capital to nonfarm employment.

He concludes that the adjustment problem of commercial agriculture is a composite one consisting of excessive production costs and overproduction. In his judgement the solution lies (1) in better organized farms on which technology is used more extensively and costs are held to a minimum, and (2) in an active program that will encourage the transfer of labor and capital to the nonfarm economy.

#### *Commentary*

I have few comments to make on this paper which is to say that I generally agree with Kaldor.

The soil bank depends on the rationing of land as a means of controlling production. Although this is the major means, the soil bank depends for control not only on the rationing of land but also on reducing labor in agriculture. The taking of whole farms out of production, as is being encouraged, certainly does this.

The aim of the conservation reserve program has been to encourage the taking of the poorer land out of production. This has been done by keeping the rental rates relatively higher in relation to alternative crop returns in areas with poorer land, and by paying the same rate to a farmer regardless of what quality land he takes out of production.

The conservation reserve has had very little effect on reducing acres and even less on reducing the total production of farm products. Favorable weather, I believe, must be given some credit, but even under average weather conditions acreage cuts are not likely to bring corres-

ponding cuts in production. A part of the increase in production in 1957 resulted from planting uncontrolled crops on land normally fallowed or in hay or pasture. The plugging of this loop-hole by use of a soil bank base for the whole farm would make the program more restrictive.

The benefits from permanent cover should include reduction in wind erosion losses for much of the Great Plains. The change to permanent cover for much of this land may be an efficient use of the land resource.

I agree that the conservation reserve is relatively inefficient in encouraging the movement of labor and capital out of agriculture, but we do not want to minimize the boost in that direction. Educational and informational services will help and a few dollars in the hand may go a long way in accomplishing bigger things.

Men working with the program differ on the need for higher rental payments to increase participation. I see a need for adjustments in county rates in our western range area. Since many of the operating units are large in the range area and in our central wheat-livestock areas, the raising of the \$5,000 limit might be another way to increase participation.

Another alternative might be a program that would be aggressively aimed at regrassing the poorer land in the Great Plains. In many areas there are large amounts of crop land best suited for grass. A program to encourage grass may in the long run be economical for the country.

### *Some Things to Consider in Improving Our Programs*

In view of the outlook for the next few years, what we are seeking is a shrinkage of production resources in agriculture as a means of achieving a production-consumption balance and higher farm incomes for those farmers remaining in agriculture.

1. More progress would be made with farm operators who are 65 or older. In many cases social security payments are not sufficient for full retirement. Partial or full participation in the soil bank would supplement income and would contribute to a reduction of production. Since some of these operators will be on small farms the alternative of selling the unit to another smaller farmer rather than as a separate unit should be considered. These alternatives would involve a combination of motivations including noneconomic goals of leisure and general welfare and specific economic incentives.

2. Many small-scale commercial farmers are on units too small for family farms. By participating in the soil bank on a whole-farm basis a small steady income would be helpful in training for or getting located in a nonfarm job. Supplemental programs would also be needed. Efforts to reorient the vocational agricultural program toward "training rural youth" rather than "training boys to farm" should be continued and

intensified. The employment services should be expanded to furnish information about employment opportunities. Such information should include both economic and noneconomic opportunities.

3. The third major area would involve the great bulk of commercial farms. Some of these with adequate-sized units could afford to farm more extensively thereby having more leisure but less income. Here the soil bank may encourage this move.

Many of the farms in this general group could profit by a better organization of the resources, more extensive application of technology, and cost cutting without greatly increasing production. If the changes in organization involved extensive shifts from grains to grass and livestock the soil bank and agricultural conservation program would be helpful in bringing about the change.

# TECHNOLOGY, POLICY, AND THE MILK INDUSTRY

Chairman: R. W. Bartlett, University of Illinois

## IMPACTS OF TECHNOLOGICAL DEVELOPMENTS ON THE SUPPLY AND UTILIZATION OF MILK

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THE depth of the term, "technological developments," is dwarfed only by the width of the terms, "supply and utilization of milk." Thus, the assigned subject has forever-rambling boundaries. We will attempt to narrow this paper, but it will at times strain these boundaries.

This broad sweep will say a word about the general nature of technological developments and their study. We will look slightly longer at some attempts at measuring technological developments in the dairy-processing industry and some of the implications. A rather superficial look of the same character will involve dairy production. These undertakings merit a few comments on expected effects of technological developments for the future.

### *Nature of Technological Developments*

Paradoxically, Americans view technology as a strange, yet almost household concept. We have grown up with it. Yet, each of us would probably define it differently. Most working definitions emphasize applied results of physical sciences.<sup>2</sup> The emphasis in this paper will also be on the physical sciences, but our definition will be broader.

Improved technology and capital accumulation must be the basic sources of economic progress for society. Technological developments accomplish economic progress through creation of new production functions assuring greater output relative to input. Specific innovations shift marginal physical rates of substitution of one factor relative to that of another. To catalogue innovations by their effect on marginal physical rates of substitution of various factors is a worthwhile and meaningful economic endeavor. Technology feeds upon itself and is traditionally self-renewing. Thus, its aspects elude classification of cause and effect.

<sup>1</sup> This draws heavily on T. C. Walz, "The Impact of Technology on the Dairy Industry," unpublished Doctor's thesis, Purdue University, June, 1956. Acknowledgement is made of the assistance of Vernon W. Ruttan in preparing this paper.

This is Purdue University Journal Paper No. 1154 approved for publication August 16, 1957.

<sup>2</sup> *Technology in Food Marketing*, Agriculture Monograph 14, USDA, October, 1952, page IV.



Technology leads to nontechnical results and may have nontechnological origins. This mandates a broad concept.

The rate of technological development varies widely among farms and marketing institutions. Average concepts in this area are misleading. Competitive structure influences rate of technological development. The individual firm with a horizontal demand curve can often gain more by early adoption of innovations than can a firm with a sloping demand curve. Yet, some hold that oligopolies are more progressive. The manager under atomistic competition will innovate where he can, but modern business conditions circumscribe narrowly where he can innovate. However, an oligopoly has many more possibilities. Also, oligopolies can create their own inventions; whereas atomistic-type firms tend to rely on others. The oligopolist might look good in absolute comparisons and bad in relative comparisons.

### *How To Measure The Effects of Technological Development*

Ruttan<sup>3</sup> has outlined and compared alternative methods of measuring the effects of technological developments, including the so-called productivity of labor, production function, and input-output approaches. The studies reported here for dairy processing used the input-output method based upon suggestions of Copeland and Martin,<sup>4</sup> and Stigler.<sup>5</sup> Also this method was used by Ruttan in his studies of meat packing and in other work reported at this meeting.<sup>6</sup>

The suggested input-output approach conceives of selecting a base year ( $t_0$ ) in which a firm or industry operates at or near equilibrium. When the data on the income statement of another year ( $t_1$ ) in which equilibrium conditions exist are corrected for price changes, the percentage difference between the Laspeyre input index in  $t_1$  and the Laspeyre output index in  $t_1$  will measure the contribution made by technological change to output between  $t_0$  and  $t_1$ .

This procedure results in an exact measure of technological change only when the following conditions hold:

1. The industry, or firm, must operate under conditions of equilibrium in  $t_0$  and  $t_1$ .
2. There must be constant returns to scale.

<sup>3</sup> Vernon W. Ruttan, *Technological Progress in the Meatpacking Industry; 1919-1947*, USDA Marketing Research Report 59, January, 1954, and "Growth In Output Per Unit of Total Input In Agriculture and the Rest of the Economy," Vernon W. Ruttan, presented at this meeting.

<sup>4</sup> Morris A. Copeland and E. M. Martin, "The Correction of Wealth and Income Estimates for Price Changes," National Bureau of Economic Research Conference on Research in National Income and Wealth, *Studies in Income and Wealth*, Vol. 2, New York: National Bureau of Economic Research, 1938.

<sup>5</sup> George J. Stigler, *Trends in Output and Employment*, New York: National Bureau of Economic Research, 1947, pp. 43-45.

<sup>6</sup> *Loc. cit.*

3. The prices of the factors of production relative to each other and the prices of the products of the industry, or firm, relative to each other must not change.
4. Technological progress must be neutral. That is to say, if the production function prior to technological change is  $f(x, y, a, b) = 0$ , where  $x$  and  $y$  represent products and  $a$  and  $b$  factors, then technological change is neutral if it yields the production function  $f(Tx, Ty, a, b) = 0$  when  $T$  is a constant greater than 1 if the change is progress.

The studies reported here on dairy processing utilized both gross and net definitions of input-output. When using the gross definition we refer to output as total sales and input as the sum of labor, capital, and intermediate products. The net definition refers to output as value added by manufacture and input as the sum of labor and capital. The net input-output approach is employed in order to permit valid inter-industry comparisons. The gross input-output approach is employed in order better to explore the role of current inputs in the expansion of the industry's gross output.<sup>7</sup>

In regard to the assumption of equilibrium, our comparison years were generally peak or near peak years of the business cycle. These years weighed well in regard to supply-demand balance, investment rates, and other expected conditions of long-term general equilibrium. The year 1954 is probably the most questionable.

The assumption of constant returns to scale rightly raises questions. The distribution of fixed assets and the ratio of total fixed assets to sales for each of the three largest dairy firms, are quite similar. A rather superficial check on certain small firms did not reveal major inconsistencies here either. Kelley<sup>8</sup> showed some tendency of increasing returns in 168 creameries; however, his data also show considerable evidence of constant returns to scale. Rowe<sup>9</sup> found some evidence of increasing returns to scale in 16 Oregon cheese plants. The Federal Trade Commission studies<sup>10</sup> of 1939 tended to find medium-size dairies the most efficient, as did Young<sup>11</sup> in a study of New York fluid and diversified plants.

<sup>7</sup> Kenneth May, "Technological Change and Aggregation," *Econometrica*, Vol. 15, 1947, pp. 51-63. Also, see Vernon W. Ruttan *op. cit.*, pp. 24-28.

<sup>8</sup> Paul L. Kelly, *Resource Productivity in Agricultural Marketing Firms in the Midwest*, Progress Report No. 380, Kansas State College, February, 1956, pp. 206-209, 237, 254, 265-266.

<sup>9</sup> Gordon A. Rowe, *Economics of Cheese Manufacturing in Tillamook County, Oregon*, Oregon State College, Agricultural Experiment Station Bulletin 529, December 1952, p. 30.

<sup>10</sup> W. J. Ballinger, "Relative Efficiency of Large, Medium-Sized, and Small Business," *Investigation of Concentration of Economic Power*, Monograph 13, Temporary National Economic Committee, 76th Congress. Washington: Government Printing Office, 1940, p. 14.

<sup>11</sup> E. C. Young, "The Spread Between Farm and Consumer Milk Prices in New York State Markets," *Report of the New York Temporary Commission on Agriculture, 1950-51*. Legislative Document (1951) No. 34, Part 3. Albany, New York: Williams Press, Inc., 1951.

Dairy economists in recent years have tended to take economies of scale for granted. Such a flat assumption may be premature. Several of the bench mark studies were based on very small plants. A growing amount of evidence, particularly in the fluid component suggests that the medium-size plant may have the edge. The wide variation in efficiency within any plant size group further cautions against generalizing on efficiency due to scale alone. Moreover, most studies on this subject have been mainly concerned with plant operations; they have not considered selling costs. Since selling cost will turn up after a certain output, the combined cost curve may be different from the plant operations cost curve.

Organizations continue to grow in size, and evidence of increasing returns exists. However, the evidence is not convincing enough to render the input-output methodology entirely inappropriate. Even if the effects of increased scale and technology are compounded, the combined answer may be the most useful in the end.

The assumption of no change in relative prices, of course, involves the basic "index number bias" problem. This is circumvented by giving estimates on 1929 and 1954 price bases.<sup>12</sup> The data for 1947 and prior years are comparable. However, changes in census definitions in 1954 render it impossible to get complete comparability of 1954 data. Thus, the 1947 price base will also be shown.

The assumption of non-neutrality of technological change seems logical, in light of our results showing somewhat similar labor and capital savings over the total period analyzed. However, it is possible to set at least one limit on the range of these measures even where this assumption is violated.<sup>13</sup>

### *Impacts on Dairy Processing Industry*

*Manufactured dairy products industry.* On a net input-output basis, inputs required to produce a given output of manufactured dairy products fell by 60 to 74 percent between 1919 and 1954 (Table 1). The

<sup>12</sup> Certain years have been "normalized" with 1929, 1947, and 1954 selected as base years for comparisons. The "normalization" procedure is as follows: Indexes of input and output were constructed from value data for the comparison years. The value data were expressed in terms of 1929, 1947, and 1954 dollars. To obtain the labor input required to produce a given net output for any one year in terms of 1929 prices, the input of labor in 1929 dollars for that year was divided by the index of value added for that year. The capital input required to produce a given net output was obtained in the same manner. The total input required to produce a given net output was obtained by adding the inputs of labor and capital in 1929 dollars and dividing their sum by the same index of value added for that year. These adjusted, "normalized" data were then expressed as indexes on a 1919 base. The other comparison years were used to provide a bracketing procedure to take care of the effect of relative price changes and/or index number bias.

<sup>13</sup> Vernon W. Ruttan, *op. cit.*, p. 20.

greatest percentage decrease occurred between 1919 and 1929.

These estimates compare favorably with estimates of technological progress in other sectors of the economy. Barton and Cooper<sup>14</sup> showed that between 1919 and 1947 the inputs required to produce a given output in agriculture declined by approximately 30 percent. Ruttan<sup>15</sup> showed that the decline in the meatpacking industry during this period was roughly 25 percent, or between 16 and 42 percent. J. W. Kendrick estimated the annual increase from 1919 to 1953 in output per unit of input for the entire economy at 2.2 percent and the major industrial groups at 2.9 percent.<sup>16</sup> The annual increase for the dairy processing industry was 2.4 percent.

The gross input-output estimates show that savings of resources were slightly more than one-fourth between 1919-1954 (Table 1). Ruttan, in his study of the meatpacking industry, found comparable savings of only about five percent between 1919-1947.

Our over-all input-output estimates are probably much better, especially on inter-period comparisons, than our individual resource estimates. Yet, a look at the individual resources helps explain how these over-all savings occurred. Milk is the dominant input (Table 2). The quantity of milk required to produce a given gross output declined about 30 percent from 1919-1954 (Table 1). The 1919-1929 decade was a period of expansion in the butter industry. Creamery butter production approximately doubled in this period. This period saw extensive adoption of the centrifugal farm separator. The organization of manufacture and distribution of butter, particularly in regard to merchandising cooperatives, also underwent rapid change. The butter industry accounted for nearly three-fourths of the milk used in manufacture by the end of this period.

During the 1930's, new developments in milk drying made feasible the collection of skim milk and whey previously fed to farm animals or poured down the drain. Although utilization of by-products received the real impetus from World War II, manufacture of milk powder was stimulated by about a 10 percent decline in marketing of farm-separated cream between 1929 and 1937. Whey production increased 162 percent between 1937 and 1953. However, casein production declined about 92 percent in this period.

World War II stimulated the manufacture of condensed, evaporated and dried milk. It also stimulated the search for new techniques and processes to increase the yield from a given amount of milk; it provided a demand situation favorable to new products, and placed oleomargarine

<sup>14</sup> Glenn T. Barton and Martin R. Cooper, "Relation of Agricultural Production to Inputs," *Review of Economics and Statistics*, Vol. 30, No. 2, 1948, pp. 117-126.

<sup>15</sup> Vernon W. Ruttan, *op. cit.*, pp. 7-9.

<sup>16</sup> John W. Kendrick, *Productivity Trends: Capital and Labor*, New York: National Bureau of Economic Research, Inc., Occasional Paper 53, p. 14 (Table 3), 1956.

TABLE 1. INDEX NUMBERS OF NORMALIZED FACTOR INPUTS FOR MANUFACTURED DAIRY PRODUCTS INDUSTRY ON NET AND GROSS OUTPUT BASES, SPECIFIED PERIODS, UNITED STATES\*

Year	Net input-output estimates			Gross input-output estimates				
	Labor	Capital	Total	Milk	Supplies other than Milk	Labor	Capital	Total
<i>1929 prices</i>								
1919	100	100	100	100	100	100	100	100
1929	33	70	52	111	136	72	155	118
1937	26	53	40	89	225	54	108	96
1947	39	30	34	55	323	73	56	74
1954	27	26	27	69	212	48	46	73
<i>1947 prices</i>								
1919	100	100	100	100	100	100	100	100
1929	32	70	51	112	137	73	158	114
1937	26	52	39	92	231	56	112	99
1947	39	30	34	56	329	75	58	76
1954	27	25	26	70	214	49	46	74
<i>1954 prices</i>								
1919	100	100	100	100	100	100	100	100
1929	49	105	77	109	134	71	154	112
1937	40	80	60	89	223	54	108	96
1947	59	46	52	55	321	73	56	77
1954	41	39	40	69	209	48	45	72

\* Basic data source was the Census of Manufacturers. The gross output index was computed by deflating census data on "value of products shipped" by a weighted index of wholesale prices of manufactured dairy products. This index was also compared with the Federal Reserve Board index ("New Federal Reserve Index of Industrial Production," Federal Reserve Bulletin, Vol. 26, August, 1940, pp. 762, 851-853) and The Fabricant Index (Solomon Fabricant, *The Output of Manufacturing Industries, 1899-1937*, New York, National Bureau of Economic Research, 1940, p. 358). The net output index was computed by deflating the census "value added" classification by the weighted index of wholesale prices mentioned above. The index of milk input was computed from USDA estimates of physical quantities of milk entering manufactured dairy products and U. S. average prices paid producers for milk delivered to condenseries. The index of supplies other than milk was obtained by subtracting from the census classification "cost of materials, fuel, electricity, and contract work," the cost of milk, and then deflating by the National Bureau of Economic Research index of prices of producers' goods. The labor input index was taken from census classification of "salaries and wages, total" and "number of production and related workers." The capital input index was computed from published records of the four largest dairy companies and supplemented with material from *The Stevens Valuation Quarterly*, October 1955, Chicago: Marshall and Stevens, Inc., 1955. More complete detail on the complete construction of these indexes is given in Walz, *op. cit.*, Appendix A.

squarely in competition with butter. Thus, butter utilized 21 percent less of the net whole milk equivalent used in dairy manufactured products in 1947 than it did in 1939. The other manufactured dairy products, especially cheese, had increased substantially so that total milk input in the absolute sense increased.

New equipment installed after World War II aided materially in reducing plant losses of milk. Trade estimates suggest that losses of milk may well have been reduced from five percent prior to World War II to 1 percent now. Moreover, new processes such as lactose manufacture have "stretched" the milk input even farther.



The quantity of supplies other than milk necessary for producing a given gross output about doubled from 1919 to 1954. The major developments responsible for these changes were the trends toward large-scale manufacturing and increased consumer services borne by the manufacturer. The shift from largely steam-power, batch-type equipment in the early years, to continuous-type processing equipment powered by electric motors in the later years contributed greatly to efficiency, but involved larger outlays for certain utilities included in this category.

The 1929-1937 period witnessed an increased rate of specialization of marketing functions that continued through current periods. New developments in packaging butter, cheese, and other products and develop-

TABLE 2. PERCENT OF NORMALIZED TOTAL INPUT, BY INPUT FACTORS, MANUFACTURED DAIRY PRODUCTS INDUSTRY, ON 1929 GROSS OUTPUT BASE, SPECIFIED PERIODS, UNITED STATES

Year	Milk	Supplies other than Milk	Labor	Capital	Total
		(percentage of total)			
1919	69	6	12	13	100
1929	67	8	8	17	100
1937	64	15	7	14	100
1947	51	27	12	10	100
1954	66	18	8	8	100

ment of large-scale national sales departments resulted in greater inputs of this type. Inputs of supplies other than milk per unit of gross output have now moved up to account for about one-fifth of the total inputs per unit of gross output. The drop in this category since 1947 is difficult to explain. Part of this drop is probably due to change in census definitions. Also, comparison with the milk input in this period suggests that changes in over-all product line may be a major part of the explanation. Manufactured products under federal price support sold in bulk quantities probably require less of these factors both in processing and distribution than do other products. Yet, support price policy had been rather demanding relative to containers and other quality control factors.

Labor required to produce a given unit of gross output was approximately halved from 1919 to 1954. The 1919-1929 decade witnessed large amounts of capital being substituted for labor. It was a period where labor-saving machinery was introduced and large-scale manufacture undertaken.

The 1929-1937 period saw a decline in labor input along with a decline in capital input per unit of gross output. Severe plant contraction forced a tendency to operate more efficiently. Thus, absolute input of

labor and capital declined. Additions to plant equipment made in the 1920's had to suffice.

World War II needs challenged the productive capacity of the industry. To a large extent, the productive capacity that existed in 1940 had to suffice for the duration of the war. Output demands were acute, but labor skills were low and efficiency suffered.

The 1947-1954 period was marked by an absolute decline of about 25 percent in the number of production workers in the dairy products industry. New machines and automatic equipment improved labor efficiency. Probably the effects of this retooling period are understated in the improved labor input-output index since 1947.

Despite the rather sharp improvement in labor use in the 1920's, the improvement since then has been at a slower pace. These results tend to conform to Ruttan's findings in the meatpacking industry, but are in sharp contrast with developments in the economy as a whole.

Capital required to produce a given gross output was more than halved during 1919-54. Substantial substitution of capital inputs per unit of gross output have declined with labor. Ruttan found this same relationship in the meatpacking industry as did Creamer<sup>17</sup> in studying all manufacturing in industries between 1899 and 1948.

*Fluid milk industry.* Inputs in the fluid milk industry required to produce a given net output fell by between 23 and 37 percent from 1941-1954; or, an average of about a 2.1 percent decline per year (Table 3). Savings of resources were approximately 8 percent between 1941 and 1954; or, about a 0.6 percent decline per year (Table 3).

Milk has been the dominant input (Table 4). From 1941 to 1954, the quantity of milk required to produce a given gross output declined about 20 percent. Practically all of this decline occurred between 1941 and 1947. Such a reduction seems hard to explain. Some of it logically has been due to change in the product. An indication of the extent to which changes in fluid milk have occurred is illustrated by the following information printed on a typical one-half gallon paper milk container: "Grade A, Pasteurized, Homogenized, Vitamin D, Milk; 400 U.S.P. Vitamin D units (Activated ergosterol) added per quart by A.R.P.I. process." Low-fat milk and skim-milk sales have also increased, mainly since 1947. A 20-percent decline in the quantity of milk required to produce a given gross output between 1941 and 1947 probably overstates the case.

Supplies other than milk per unit of gross output rose about 59 percent during 1941-54. The explanation here is much the same as given for manufactured dairy products. Rapid adoption of paper containers was a factor since paper containers under most conditions result in greater con-

<sup>17</sup> Daniel Creamer, *Capital and Output Trends in Manufacturing Industries, 1880-1948*. New York: National Bureau of Economic Research, Inc., Occasional Paper 41, 1954.

TABLE 3. INDEX NUMBERS OF NORMALIZED FACTOR INPUTS FOR FLUID MILK INDUSTRY ON NET AND GROSS OUTPUT BASES, SPECIFIED PERIODS, UNITED STATES\*

Year	Net input-output estimates			Gross input-output estimates				
	Labor	Capital	Total	Milk	Supplies other than milk	Labor	Capital	Total
<i>1947 prices</i>								
1941	100	100	100	100	100	100	100	100
1947	61	39	54	79	140	100	63	89
1954	66	56	63	80	159	94	79	92
<i>1954 prices</i>								
1941	100	100	100	100	100	100	100	100
1947	77	49	69	78	139	99	62	89
1954	80	68	77	79	158	93	78	92

\* Basic data source was the continuing series of studies by Indiana University, School of Business, for the Milk Industry Foundation. These indexes were constructed as nearly as possible in the same way as those in Table 2. See Walz, *op. cit.*, Appendix A, for more detail.

tainer cost per unit than do glass bottles. Other ingredients such as vitamins, as well as increased use of certain utilities, had their affects.

Labor input per unit of gross output declined about 6 percent from 1941 to 1954. Much the same situation exists here as for manufactured products relative to the substitution between capital and labor. The trend away from home delivery has been especially pronounced since 1950 with many firms operating retail routes only three days per week. This undoubtedly has increased labor efficiency in distribution.

Capital necessary to produce a given gross output declined 21 percent from 1941 to 1954. Much equipment was discarded in this period because of obsolescence. The gains made in plant and equipment design and widespread introduction of new containers forced equipment and buildings replacement.

#### *Impacts on Dairy Farms*

Much has been written about the impacts of technology on dairy farms. Yet, the best empirical measures probably appear in the rather

TABLE 4. PERCENT OF NORMALIZED TOTAL INPUT, BY INPUT FACTORS, FLUID MILK INDUSTRY, ON 1947 GROSS OUTPUT BASE, SPECIFIED PERIODS, UNITED STATES

Year	Milk	Supplies other than milk	Labor	Capital	Total
		(percentage of total)			
1941	63	13	17	7	100
1947	55	21	19	5	100
1954	54	22	18	6	100

TABLE 5. CHANGES IN PRODUCTION PER COW, MILK COWS PER FARM, NUMBER OF FARMS, FARM OUTPUT PER MAN-HOUR, AND FARM OUTPUT PER UNIT OF INPUT, DAIRY FARMS, SELECTED YEARS, UNITED STATES

Year	Production per cow <sup>a</sup> (pounds)	Milk cows per farm <sup>a</sup>	Number of farms with milk cows <sup>a</sup>	Percent of all farms with milk cows <sup>a</sup>	Farm production per man-hour on milk cow enterprises <sup>b</sup> (1947-49 = 100)	Production per unit of input on dairy farms <sup>c</sup> (1947-49 = 100)		
						Central North-east region	Eastern Wisconsin Region	Western Wisconsin Region
1910	n.a.	3.3	5,140,869	81	64	n.a.	n.a.	n.a.
1929	4167 <sup>d</sup>	4.4	4,461,296	69	66	n.a.	n.a.	n.a.
1930	4508	4.6	4,452,936	71	75	97	87	100
1940	4622	5.2	4,644,317	76	77	99	94	100
1950	5314	5.8	3,648,257	68	107	105	101	104
1954	5657	6.9	2,956,900	62	116	114	106	112

<sup>a</sup> 1954 Census of Agriculture, Special Report, *Dairy Producers and Dairy Production*, Vol. III, Part 9, Chapter V, p. 7.

<sup>b</sup> *Changes in Farm Production and Efficiency*, ARS 43-33, USDA, June 1956, pp. 32-33.

<sup>c</sup> *Costs and Returns, Commercial Family-Operated Farms by Type and Size 1930-1951*, USDA Statistical Bulletin 197, Nov. 1956 and *Farm Costs and Returns, 1955*, USDA Ag. Information Bulletin 158, June 1956.

<sup>d</sup> 1924.

simple and rough data of Table 5. The massive strides of biological innovation are dramatized by the increases in production per cow. Mechanical innovations make themselves felt to a large degree in the number of cows kept per farm. The total effects on an individual farm are roughly measured by the changes in output per man hour and per unit of total inputs. The macro effects find themselves reflected in the number of farms keeping milk cows. Certainly, other measures may give better absolute values of these effects, but the comparability of these data probably make them as useful as any for background.<sup>18</sup>

Biological innovations have made a greater impact on dairy farms than mechanical innovations. Output per cow has had an average annual increase of about 1.4 percent since 1924, and an even greater rate recently. Improved breeding practices have been a dominant factor. Artificial breeding can garner much evidence of its influence. Any technique that can influence the genes of nearly 2,000 dams for one sire has great leverage. With one-fourth of all cows now being bred artificially, the impact here is important. Moreover, because the effect on the progeny lags the number bred by about five or six years, much of this effect lies ahead of us.

The impacts of technological developments in feeding are not so clear-cut. Certainly, we have not had the scientific "break through" ex-

<sup>18</sup> A wealth of descriptive material appears in the 1954 Census of Agriculture, Special Report, *Dairy Producers and Dairy Production*, Vol. III-Part 9, Chapter V.

perienced in the beef cattle feeding area. In fact, a recent USDA report was quite critical in this area saying dairy farmers are getting only eight percent more milk per pound of feed now than in the 1920's. Inclusion of technology in producing and handling roughage in this picture brightens it.

A recent USDA report is encouraging concerning the shift to fall freshening. Possibly some improved technology is having an influence here. Probably the work on environmental control with dairy cows is starting to have an effect. Thus, behind the rather remarkable increases in production per cow lies a rather well grounded set of biological innovations.

Mechanical innovations have not been without their effect upon dairying. Certainly dairying has shared in the substitution of mechanical and electrical power for horse power. In addition, artificial breeding has moved the bull off the farm along with the horse and the mule. Efficiency in fieldwork has made major strides; however, efficiency in caring for the dairy herd has not kept pace. Today, a poor labor balance exists on many family farms. Some evidence indicates that trends toward loose housing have brought improved labor efficiency.

Capital investments have often been made to improve factors such as milk quality. Thus, comparisons on physical terms may understate the case for the effect of mechanical innovations. For example, farm bulk tanks, recently reported on 16 percent of the farms in 58 federal-order markets, give some savings that do not show in conventional comparisons concerning efficiency.

Both types of technological developments have been predominantly output increasing. The biological ones most certainly have. Dairy farming has traditionally been considered a long-run business, and current specialized capital outlays such as bulk tanks, tend to keep it that way. Moreover, many feel that the people in dairying are less prone to move into other lines of work, and their alternative farm opportunities are usually less attractive than those for some other farmers. Innovations, thus, tend to have an even greater output-increasing effect in the aggregate dairy industry than in some other types of farming.

Dairy farmers have felt rather severe profit pressure. Numbers have been reduced and yet the government has purchased about 4 percent of production since 1949. The individual dairy farmer has no choice but to employ improved technology even though it is usually output-increasing. Yet, the aggregate effect has put him in a position where he must have rather important cost reductions to maintain net income.

Two developments have tended to ease this situation. Distribution techniques have allowed farmers to purchase their own needs at prices that have eliminated many small herds kept mainly for milk used on the



farm. Also, improved technology has made it possible for many Corn Belt farmers to purchase commercial nitrogen cheaper than they can grow it. Thus, the major reason for having side-line dairy herds is removed and the herds themselves are disappearing from these farms.

### *Possible Implications for The Future*

The over-all record of the dairy industry in adjusting to technological developments compares favorably with that of other industries studied. Processing firms can take some special pride in the reduction of milk input per unit of output. Farms can take some special pride in the increase of production per cow. Neither has done as well on labor efficiency as would appear possible. This appears to be an area for future work.

Technological developments have tended to make the farm and firm more alike. Both have grown in size and will probably continue to do so. However, at least one special characteristic of farms, the sequential nature of processes, will always tend to make them different.

Improved technology, especially because of its output-increasing tendency, has created an industry problem for dairy farmers. Profits of individual dairy farmers can be increased either by increased demand (including subsidies), lower costs, fewer farms, or some combination of these. Widespread mergers, often allegedly to take advantage of improved technology, have brought the dairy processing industry under rather close public scrutiny. Extremely wide variation exists in the input-output ratios of individual firms and farms. Although the over-all record appears good, this wide variation should provide incentive for all. Technological development for the most part has been more evolutionary than revolutionary.

Quantitative analyses of the effects of technology on the dairy industry are not a large part of our dairy marketing literature. Further work should be done. The input-output approach seems to be a research technique with merit.

### DISCUSSION: IMPACTS OF TECHNOLOGICAL DEVELOPMENTS ON THE SUPPLY AND UTILIZATION OF MILK

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The paper by French and Walz consists of three parts. The first presents definitions. The second deals with the impacts on dairy farms; the third, with impacts on dairy processing.

The authors note that the usual definition of technology emphasizes the

physical sciences. They prefer a broader definition of technology; and I agree with them. But I think we have here another example of trying to make a word have a broader meaning than it customarily bears. An older label for this concept was the expression "state of the arts." This phrase has fallen into disuse, and it has an archaic sound. Nevertheless, it seems to me that it is more naturally understood to include such nonphysical phenomena as finance, market structure and management.

Let us turn now to the section on impacts on dairy farms. The measures of increasing efficiency on dairy farms are familiar ones: output per cow, per man hour, per unit of input on family-operated dairy farms. The discussion of the areas in which technological innovation has been at work is also familiar to persons who are well informed on current developments in dairy production.

The paper touches on two problems in a way that did not fully satisfy me. The comment on the output-increasing tendency of technological improvements in dairy farming seems unconvincing. A distinction must first be drawn between economies of scale for the firm and of those for the industry. There is not much reason to doubt that economies of scale for the firm have weighed heavily toward increased output. But there has been a substantial attrition of numbers of farms with herds of 15 to 19 cows and less. There seems to be no reason related to technology that explains why this rate of attrition should have just fallen short of offsetting the increases in numbers of farms having larger numbers of cows, nor the higher milk production per cow.

The second point at question in this section—the suggestion that output-increasing innovations have been adopted out of the pressure to maintain net income—is related to the first. Let us use output per cow as a measure of the rate at which innovations were adopted. Then from 1944 to 1947 output went up 9.4 percent. From 1953 to 1956 it went up 8.4 percent. In the former period, average returns from marketings of milk and cream rose from \$3.02 to \$4.12 per 100 pounds of milk. In the latter period, returns fell from \$4.19 to \$4.01. In view of the fact that output per cow changed at virtually the same rate in two such widely contrasting price situations, one is entitled to question whether income considerations have any effect on the adoption of innovations.

Impacts of technology on dairy processing are the basis for perhaps the unique contribution of this paper. The authors have applied a recently developed methodology. As may be the usual case with relatively untried methodologies, the results are ambivalent. On one hand, they purport to give a new insight into industry dynamics. On the other hand, the asserted new insights must be reconcilable with independent observations as a test of the validity of the new method.

At the outset, we are made aware that the dairy industry does not meet the conditions that must hold if this measure of technological change is to give exact results. The condition of equilibrium, the condition of economies of scale, relationships among factor prices, are all violated; and the neutrality of technological progress may be doubted. This should warn us to expect inexact results. We are more apt to be testing the methodology than to be gaining new insights with increased confidence.

It is not clear from the paper whether the procedures adequately account for certain effects of shifting utilization that should not be counted as technological progress. The value of shipments in the butter industry was \$1.17 for each \$1.00 of materials in 1952. The value of shipments for the ice cream industry in that year was \$1.82 for each \$1.00 of materials. Between 1924 and 1956 the use of milk for butter decreased from 73 percent of the milk used for manufacture to 48 percent. Ice cream (gross) increased from 10 percent to 17 percent of the total.

Such changes in utilization are attributable to changing demand, rather than to changing technology. They would give a spurious indication of rising output per unit of input if not properly compensated. The paper does not show clearly that the series were deflated for this factor. The comments made would indicate that such effects remain in the data. This is suggested, for example, in the emphasis that the paper places on new developments in milk drying, and on the relationship of World War II to new techniques and processes.

Among other inexplicable results of the methodology used in the paper, is the data for 1947. Microeconomic data, such as those by Koller and co-workers in Minnesota, give no basis for expecting such results. French and Walz concede the possibility that changes in census definitions may have been responsible, but then suggest that requirements of the price support program account for the result. This explanation, along with some that are offered for other results of the analysis, seems strained.

The section on technological impacts on input-output relationships in dairy processing constitutes the major contribution of the paper. I have indicated some reasons for not accepting the results for all that they are presented to be. The major contribution of the paper is to increase our knowledge of the methodology used. To a much less extent it gives us additional insight into the evolution of resource use in the dairy processing industry.

## ECONOMIC EFFECTS OF REGULATION AND PRICE FIXING IN THE MILK INDUSTRY

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### *Introduction*

THIS paper is largely restricted to a discussion of the economic effects of the types of regulation administered and enforced under federal milk marketing orders and the state analogues, although some attention is directed toward health and sanitation measures. Little examination is made of general regulatory measures such as antitrust legislation, labor legislation, tax legislation, etc. or private regulatory measures such as might be established and operated by a cooperative. Rather than attempting to make a general evaluation of the economic effects of regulation and price fixing in the milk industry, a more limited goal is set, consisting of commenting on the following three questions:

1. Over what range can "milk-price-fixers" manipulate the price of milk?
2. To what extent does regulation and price fixing influence the structure of the industry?
3. What are the economic effects of several of the major building blocks of milk industry regulation?

A paper on a subject this broad is of necessity an oversimplification and at many points a choice had to be made of saying nothing, of making a general comment with little or obvious content, or of making a specific statement not adequately qualified. Examples of each of these unfortunate alternative choices can be found in this paper. The value of this paper, if any, is to open up the subject—not to present a complete analysis.

### *Limits to Milk Price Fixing*

The limits between which milk-price-fixers can manipulate the prices of milk are examined with reference to items priced out of the market, prices within markets, and prices among markets.

#### *Items priced out of the market*

Many milk products, services, as well as milk producers and dealers, are priced out of the market by direct prohibitions and indirectly by requirements with secondary effects on prices paid and received. Although our primary effort is not to judge the desirability of such prohibitions or

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\* Appreciation is expressed for help and assistance given by Stewart Johnson in the preparation of this paper.

infinite prices, it is in order to point out that most people would consider at least some of them as highly desirable, such as, restrictions on the marketing of milk containing pathogenic bacteria.

The situations where it is possible to fix prices that can be considered infinitely high, in that the item or service is priced out of the market, usually flow from the fact that standards are established that require the drawing of lines and thus arbitrary elements. Examples consist of the definitions used in designating whole milk, cream, skim milk and in some markets type of container, etc. Somewhat similar situations also arise when rules are placed concerning the conditions under which milk must be produced and handled, though in these cases, increased costs restricting supplies are more common than complete exclusions from the market.

The effects of the above types of regulation for a market as a whole, in contrast to their effects with reference to an individual producer or handler, are small. Milk prices are increased in markets restricting supplies, while if in a neighboring market sales outlets are lost, prices are decreased. The magnitudes of the price and quantity effects in the several markets depend on the elasticities of supply and demand. It is likely these elasticities are such (1) that aggregate milk production is decreased, (2) that gross farm income increased, (3) that net farm income is increased, but less than gross, and possibly decreased, and (4) that the gross and net farm incomes of the farmers in the markets restricting supplies are increased. The extent to which real national income is increased or decreased, compared with what it would have been with no or different regulation, is not subject to a general answer but is a matter for detailed analysis of the specific situation and of specific alternatives. The general statement to be made is that regulation of this type may result in an increased or decreased real national income depending on the following factors. . . ."

#### *Prices within markets*

The prices within markets to be considered are those received and/or paid by producers, handlers, consumers and the relationships among them. First to be considered are limits between which the prices consumers pay can be manipulated. Second, the prices paid by handlers are considered. Third, the prices producers receive are examined.

The range over which milk-price-fixers can, directly or indirectly, manipulate the prices consumers pay for milk and milk products is the widest for fluid milk and the smallest for the manufactured products made from milk. In the case of fluid milk, this range is at a maximum, some 5 or 6 cents a quart, or perhaps 25 percent of the usual retail price. Evidence to support this estimate can be obtained by examining the differences in



prices charged in various markets; price changes within and among markets; and price differences within markets among handlers, and among various products such as home delivery compared with store prices, milk in various types of containers, etc. Along with these price changes and differences, the extent of illegal price discounting can be examined in states where resale prices are fixed. The limits over which the prices of cheese, skim powder and butter can be manipulated by the individual milk market administrator are virtually zero, though these prices, at the national level, can be significantly altered by the use of price support and subsidy schemes as well as by supply regulations such as duties and import quotas.

The range over which the prices handlers pay can be manipulated is suggested by the price spreads existing within and among markets. Probably the first data to look at are those showing the differences between the prices set for Class I milk and for milk used in manufacturing. These differences, vary among markets from a minimum of about \$1.00 to a maximum of about \$3.50 per hundred-weight. The usual price differences between milk used as fluid and that used in manufacturing likely exceed the amount a milk-price-fixer can manipulate the prices handlers pay, since in an "unregulated" market dealers would pay premiums for regular supplies of milk for use in fluid form. Most milk market administrators could live with a Class I price a cent per quart higher or lower than the one prevailing, although this would build up pressures. A price change of two or three cents would, however, likely be impossible to maintain assuming the original price was not out of line. The amount by which the price of milk used in manufacturing, known usually as Class II or Class III, can be manipulated likely falls within a range of a half a cent a quart up or down, rather than the one, two, or possibly three cents as is the case for Class I milk.<sup>1</sup> If Class II or III milk is overpriced, it is not long until the market is flooded with homeless milk. If it is underpriced, premiums of many types work their way into the market.

The manipulation of prices paid to producers can take the form of a redistribution of total pool receipts among producers and/or a change in the total amount of money coming into the pool. The total amount of money in the pool, and thus the average amount per hundredweight that can be distributed, is largely determined by the prices of the several classes of milk and the amounts of milk paid for at each class rate. Variability among markets in the percentage of all milk in Class I can alter the average price producers receive by possibly as much as \$2.50 per hundredweight. If a handler pool market is tight, from 90 to virtually 100

<sup>1</sup> In a largely fluid market, this range may be a cent or possibly more per quart. The term Class III will be used to refer to milk used for nonfluid consumption.

percent of the milk entering the market can be used as Class I milk. In markets with free entry and market-wide pools, Class I use of milk sometimes falls below 50 percent.

The system of pay-outs contains arbitrary elements and this changes the returns received by various groups of producers, rather than changing the total amount of money available for distribution among producers as is the case with pay-ins. The usual provisions in orders determining the differences in payments to various groups of producers consist of several things: (1) the right of cooperatives to repool milk, (2) location differentials, (3) transportation differentials, (4) quota schemes, (5) butter-fat differentials, etc.<sup>2</sup> The combination of these measures used can affect the blend or average price an individual producer receives from a small fraction of a cent to several cents a quart.

#### *Price relationships among markets*

The price relationships among markets that grow out of regulation are such as to constitute major problems to persons concerned with dairy industry regulation and to persons engaged in the production and distribution of dairy products. Among and between markets it is not uncommon to find the prices paid to neighboring producers to be out of line by as much as \$1.00 per hundredweight. Handlers may be able to buy milk at discounts of even more than \$1.00 a hundredweight. In federal-order markets, with market-wide pools, the regulation providing for compensatory payments, the constitutionality of which appears to have a fairly high chance of being successfully challenged, serves to prevent handlers from obtaining low cost milk for resale in the regulated market. In state-order markets this type of control can not be used.

One of the new elements in the present trend in facing the problem of price differences among markets, or is it avoiding the problem, is to increase the size of marketing areas. The prime example of this situation is the extension of the New York order to cover some 60,000 farmers and 17,000,000 consumers with annual milk sales valued at close to a billion dollars at retail prices. A second way this problem is faced is for the small market to follow the large market without being swallowed by the farm organizations in the big market. This policy has in the past proven profitable to producers in small markets near big ones and to protect consumers in all markets.<sup>3</sup> The profitability of this policy, to a large extent,

<sup>2</sup> The right of cooperatives to repool milk is of major significance. This tool can be used to implement price discrimination among both handlers and producers.

<sup>3</sup> Many small controlled markets within a given area, rather than a single controlled market, tends to result in lower consumer prices. The logic behind this statement is in many ways similar to the logic underlying the notion that many firms in an industry bring about lower prices than would be the case if a single firm were the industry.

depends on how well the small market is able to ride the big one in terms of maintaining relatively high ratios of milk in Class I use and in imposing relatively high prices on Class I milk. Their success is in part measured by the extent to which prices are out of line among markets. It would, however, be an error to assume such out-of-line pricing is in all cases profitable to some group within the market. In some cases the programs have been operated in such a way that no one is now gaining and all are losing.

### *Summary*

The economic effects of regulation and price fixing can not be greater than the effects secondary to the maximum amounts milk-price-fixers can alter prices. An exact quantification of these maximum economic effects is impossible, but such an effort could be carried far on the basis of rather complete measured supply and demand elasticities. In point of fact, realized effects are always much less than the maximum possible effects—and for many reasons.

First, in the process by which prices are fixed and regulations are established an effort is made to reconcile, or at least to live with, the conflicting interests of various groups. Second, and sometimes an underestimated factor, is the genuine concern of milk-price-fixers with the public interest in its broadest, most complete, and best sense. Third, administratively, the more nearly prices are fixed the same as the market would have fixed them in the absence of a market order, the fewer the problems in operating a milk market. Fourth, numerous small markets, in contrast to a large comprehensive market or two for the country, tend to hold prices in line—by exhibiting out-of-line prices publicly rather than by permitting them to be hidden within a big order. Thus, there exist many powerful forces tending to dampen or eliminate “out-of-line” price fixing and thus dampen the economic effects secondary to regulation and to price fixing in the milk industry.

### *Structure of Industry*

The structure of the milk industry is affected in terms of the numbers and sizes of handlers and producers, the functions and services of handlers, and the geographical locations from which handlers obtain milk and in which milk is produced, as a consequence of regulation and price fixing in the milk industry.

### *Numbers and sizes of handlers and producers*

Although technological change has been the major factor bringing about decreases in the number and increases in the size of handlers and

producers in the milk industry, regulation and price fixing has had an influence. Regulations on quality of product tend to give large distributors a competitive advantage over small ones, milk pasteurization being an example. Farm inspection coupled with sanitation standards works to the relative advantage of large producers and often forces the small producer either out of the milk business or into it on a full-time basis. On the other hand quota schemes can be used to restrict the outputs of individual producers and to increase their numbers, while other regulations tend to increase the number of handlers such as special exemptions for small dealers, limitations on sizes of containers and varieties of milk that can be sold.

The fixing of prices that handlers must pay and also the fixing of resale prices shifts the competitive acts of handlers from price competition to nonprice competition.<sup>4</sup> This shift in the form competition can take likely works to the advantage of the large handlers in large markets, although the opposite may be the case in small markets.

#### *Functions and services of handlers*

The services handlers provide to consumers and producers, as well as the functions performed by various handlers, are altered by both price fixing and regulation.

Services provided to consumers are directly influenced by regulations defining resale price relationships, packaging, and commodity standards; while producer price fixing and regulation has an indirect effect. Examples of these influences consist of quantity discounts, frequency of delivery, use of paper vs. glass, store outlets vs. home delivery, size of container, butterfat content, vitamins, and other additives.

The relationships among handlers and producers are significantly altered by both direct regulation and price fixing. In market-wide pools price is largely lost as a tool to control supply, except for the use of premiums. Thus, other control measures are established such as quotas, butterfat requirements, quality requirements, minimum production requirements, etc. In handler-pool markets price can still be used as a control measure by altering the percentage of milk purchases that are paid for at the Class I rate. In some markets a handler will be able to select the "best" producers by keeping his Class I use high. On the

<sup>4</sup>This statement is inaccurate to the extent that illegal price cutting occurs. In this connection we note that small proprietary dealers have a competitive advantage, in this area, over both large dealers and cooperatives, though a cooperative can legally "lose" money and in effect underpay producer members and to, perhaps at the same time, pay a higher average price to their members for milk than other handlers if they have a high enough percentage of milk sold as fluid and if they operate in a handler pool market. In general the cooperative will, for organizational purposes, be under pressure to follow a policy of not restricting membership and of thus cleaning up the market and consequently paying a relatively low blend price.

other hand, a dealer may take steps to keep his percentage Class I use low if Class III or milk used in manufacturing is underpriced and if producers are looking for markets.

The functions performed by milk handlers are frequently altered by the types of regulation and price relationship in effect in a market. Examples concern the places in which surplus milk is processed, the types of products that are produced, and the amount of surplus that is processed. In a market-wide pool, for example, the manufacture of surplus milk is more likely to be concentrated in the more distant parts of the mildshed than is the case with a handler pool. The types of products made from surplus milk are, in a part, determined by the differences handlers must pay for milk used to produce cream, butter, cheese, powder, etc. The amount of surplus milk entering a market is significantly affected by the average level of Class III prices. High Class III prices tend to decrease the amount of milk handlers are willing to take while low ones work in the opposite direction.

#### *Geography of milk supply*

The price map of milk is affected directly by price fixing and indirectly by regulation which in turn, depending on supply elasticities, alters the amounts of milk that are produced in various places. Additionally, the use that is made of milk produced in various locations is changed.

Within milksheds, milk distant from the market is usually overpriced, in terms of the prices farmers receive, compared with milk near the market; while among markets, milk tends to be overpriced in deficit areas and underpriced in surplus areas. In terms of the prices handlers pay, rather than the blend prices farmers receive, milk within the market is usually underpriced near the market and overpriced distant from the market; while among markets, milk is overpriced in milk deficit areas. Evidence on these price relationships within markets is available for the New York market for 1955.<sup>5</sup> During 1955 in the 1-25 mile zone producers received 56 cents a hundredweight less for their milk than handlers paid; in the 151-175 mile zone the figure was 47 cents; in the 226-250 mile zone the figure was 14½ cents, while in the 376-400 mile zone producers received 91½ cents more than handlers paid.

The set of price relationships tends to change the geography of milk production as well as to redistribute income among milk producers and to transfer income from consumers to producers. Milk production tends

<sup>5</sup> These data were compiled by C. W. Pierce at Pennsylvania State University. My use of these figures in this context is misleading to the extent that the payment of premiums cancels out the pattern of prices in the above series. If a person assumes that these price relationships are canceled out one is also forced to the absurd conclusion that transportation and location differentials have no effect on the differences in prices producers in various parts of a market receive for their milk.



to be greater than it would be in the absence of market orders, especially in the outer areas of a market-wide pool market. This increased production, obtained by price regulation, is accompanied by less fluid consumption but by more manufactured products than would likely otherwise be the case.

### *Summary*

In general the use of regulation and price fixing in the milk industry tends to alter the structure of the industry: (1) through the elimination of some types of products, (2) by reducing the numbers of producers and handlers and (3) by bringing about payments to producers and costs to handlers significantly different from what a "free" market would generate.

### *Building Blocks and Tools of Milk Market Regulation*

Four major building blocks and tools of milk market regulation and price fixing are examined for economic effects. I shall not attempt to present quantitative measures of the secondary effects of the use of these tools in specific markets. Rather an effort is made to present a picture of the parts these regulatory measures can be made to play. Measures to be examined are alternative types of marketing systems, classified pricing systems, types of pooling arrangements, and producer quota systems.

### *Alternative types of marketing systems*

Milk markets may be operated under federal order, with a state order, or with no order, and the choice selected plays an important part in placing limits on possible economic effects secondary to regulation and price fixing. The major differences in the secondary effects of operating under a federal order, rather than a state order, center around three considerations. First, under a federal order all milk entering the market can be priced to handlers. Second, the costs of entry for producers tend to be low in federal-order markets. Third, under federal orders the test of a fair price to producers is tied to the concept, admittedly a bit flexible, of maintaining an adequate supply of wholesome milk.

The chief advantage of a federal order to producers is that out-of-state milk can be priced. In some markets the pricing of out-of-state milk is the compelling consideration in the choice of the type of marketing system under which to operate. In a market where handlers have a choice among states from which milk supplies may be obtained, it is frequently impossible to obtain much of a premium for in-state milk without a federal order. Although handlers as a rule are not much concerned about how much they pay for milk, they are greatly concerned about how much each of their competitors pay. Thus, when cheap out-of-state milk is available, each handler has important competitive reasons for

wanting as much cheap milk as the next handler. This in turn leads to increased out-of-state milk purchases. Consequently, local producers lose their market, unless the price of local milk is brought in line with unpriced milk. It is important to point out that the above sequence of events need not happen in a state-order market if handlers are provided with "other" reasons for not obtaining cheap out-of-state milk. "Other" reasons consist of the fact or threat of a federal order, inspection requirements, strong bargaining groups, gentlemen agreements, etc.

The cost of entry to the producer may be made higher under the usual state order than has been the case in federal-order markets. The major restrictions on entry in federal-order markets have been seasonal quota systems and handler pool arrangements. In state-order markets, any measures not illegal may be employed and state laws often permit the use of quite restrictive measures.

The test of a "fair" price for milk in a state order can be anything that the state says it is. Thus, it is possible to "fix" higher prices for milk under state orders than under federal orders. This statement is not intended to imply that under state orders such higher prices usually are set or that they could necessarily be enforced if they were.

When the choice is made to operate a market with neither state nor federal order, the free play of forces in existing markets, with their imperfections, are permitted to operate. The outcome of such a policy depends on the extent and types of competition operative in the market. These secondary effects may approach what would be expected under perfect competition, or they may more nearly approach a monopoly outcome than would be the case under a state or federal order. It is not unknown for a federal order to be discontinued in a market because, among other things, producers thought they had sufficient control over the market to do better by themselves without special legislation for milk control.

### *Classified price systems*

At the heart of milk control is the establishment of classified pricing schemes under which handlers pay different amounts for milk used in the production of various products. Given low and differing elasticities of demand for fluid milk, cream, ice cream, butter, cheese, etc., and an intelligently applied policy of price discrimination, it is feasible to transfer income from milk consumers to milk producers. In most U. S. milk markets the direct secondary economic effects of the use of classified pricing systems, given the usual other operating procedures, has been to increase the price of fluid milk to consumers, decrease the price of butter and cheese to consumers, increase gross and probably net income to milk producers, and bring about a diversion of more resources to the

dairy industry than otherwise would have been the case.<sup>6</sup> A second effect, of a long established classified pricing system, is to virtually guarantee a continuation of regulation in the market, unless interested groups are prepared to take drastic measures. A sudden elimination of price discrimination would bring about a market clearing price and a return to producers below the long-run equilibrium price—one more nearly equal to the price of milk used in butter than to the blend price farmers now receive. Thus, while it is not clear that the net incomes of dairy farmers are now higher than they would be had no classified pricing system been developed, it is clear that an elimination of classified prices would decrease the net and gross incomes of dairy farmers.

The second half of price policy, when classified prices are used, is the distribution of returns among producers. In most markets the gains from price discrimination are paid out in such a way that milk producers receive more for each unit of additional production than it is worth in terms of what the market will pay. Thus milk market regulation, by paying producers more for additional milk production than it is worth, tends to bring about a misallocation of resources by overexpanding milk production compared with other types of economic activity. Additionally, to an overproduction of milk, the milk that is produced is not likely to be produced at either the right places or times. The systems of milk pricing now in most U. S. markets tend to bring about inefficiencies into milk production, increasing costs to consumers, but without passing on all of these increased consumer costs to the farmers' net incomes.

### *Types of pooling arrangements*

The type of pool operated, handler or market-wide, plays a major part in determining the amount of milk entering a market, the average price paid for this milk, and the distribution of returns among producers. A comparison of the differences in economic effects secondary to the type of pool adopted is developed around these points.

In a market-wide pool, cost of entry for new producers and the problems of finding a market for added milk production by old producers are minimized.<sup>7</sup> The market-wide pool attracts additional milk supplies by paying for this milk at the blend price. This price is not significantly affected by the action of any one producer or by any one handler picking up additional milk supplies. Additionally, to the extent the blend price is decreased, when a handler takes on new producers whose milk is used as Class III, the prices received by producers delivering to the plants of his competitors are decreased by an equal amount. In a handler-pool

<sup>6</sup> Lower butter and cheese prices are an effect secondary to the increased supply of milk resulting from the increased blend price, resulting from classified prices.

<sup>7</sup> Costs of entry can be raised in either type pool when Class III milk is overpriced. Quotas are used with this effect in market-wide pools.

market, the handler taking delivery of additional milk for use as Class III reduces the price his producers receive without a corresponding effect on the prices other producers receive delivering to competitive plants.

Thus, a market-wide pool tends to keep cost of entry low, to attract additional milk, to lower the percentage of all milk used as Class I, to bring about a low blend price, but to assure all producers a market and the same price for their milk. In a handler-pool market, the situation is reversed but with the attendant problem of homeless milk and wide differences in the prices neighboring farmers receive for their milk.<sup>8</sup>

### *Producer quotas*

The cost of entry into a milk market is significantly affected by the use of quota systems as is the efficiency of the market, and the returns producers receive. Use of quota systems tends to increase the cost of entry into a market to both the new producer and the established producer attempting to increase his deliveries of milk. The penalties imposed by quota systems are most frequently used to alter the seasonal pattern of milk production, although they can and have been used to restrict the supply of milk entering the market in all months of the year. A second effect of quota systems, designed primarily to change the seasonal pattern of milk production, is to increase milk production during the base-forming period which may also result in an increase in milk production on an annual basis.

Use of milk quotas, to a small extent, attack the problem created by use of classified pricing systems in combination with payments to producers on an average or blend basis, by reducing the price paid to producers for the production of additional milk. Thus, cost of entry into the market is increased, although seldom by an amount large enough but what farmers continue to receive more for the production of additional milk than this milk is worth. Quota systems have and can be used to more nearly equate—for additional milk production—prices paid by consumers to prices received by producers, although they tend to freeze the pattern of milk production causing costs to be higher than they otherwise would have been.

### *Other market regulatory tools and procedures*

The several building blocks of milk market regulation discussed above do not include all of the major factors determining prices in milk markets.

<sup>8</sup> These are the reasons why most groups are afraid of handler-pool markets in large milk sheds, and it is quite true that in most cases a sudden shift from a 100 percent market-wide pool to a 100 percent handler pool would create problems the milk industry could not live with. One interesting possibility that has much to recommend it, though as yet untried, is a pool that is, for example, 90 percent market-wide and 10 percent handler; an arrangement that could be administered with virtually no additional work.

In a more complete examination of the economic effects of price fixing and regulation in the milk industry, the following areas should be examined: (1) private regulation and price fixing, (2) health and sanitation requirements, (3) general legal requirements, (4) additional regulatory devices for orders and (5) federal agricultural programs.

An understanding of the parts played by proprietary handlers and cooperatives is a requirement if price formation is to be explained. The patterns of behavior of these groups vary among markets, and, accordingly affect the types of regulations imposed, how well the regulations work, and the extent of competition in the market. Health and sanitation regulations, while not directly price fixing, are price affecting unavoidably and/or in some cases purposefully. Again the magnitudes of these effects vary widely among markets. General legislation that concerns monopoly, transportation, labor, etc. affects prices in all milk markets but not by the same amounts. At the specific level there are many features of market orders and administrative rulings that alter milk prices. These rulings cover many subjects and are frequently beyond the law in the sense that the rulings would not stand up if taken to court.

Federal agricultural programs, both the general ones and the specifically milk ones, have a significant economic impact on the milk industry. The general programs operate indirectly by changing the prices dairy farmers pay and the prices of competing food products. The specifically milk programs have been many in number. In the past the prices of some dairy products have been increased by CCC purchases, prices were held down under the OPA, restrictions on the sale of competing products have been in effect, direct subsidy payments have been made to producers, and numerous schemes have been used to subsidize consumption. Without attempting either a further description or an analysis of any of these programs, it is clear that their secondary economic effects have been and likely will be significant in the future.

### *Summary*

In a literal sense, it is impossible to list the economic effects of regulation and price fixing in the milk industry. In a more general approach to the question, the following statements are left with you for your examination and consideration. They are that regulation and price fixing in the milk industry, as they now exist, can do the following:

1. Alter the prices individual producers receive and individual consumers pay probably up to 50 percent, although the average of these prices to all producers and to all consumers can not be altered by as large an amount.
2. Tend to cause the average size of handlers and producers to increase.
3. Transfer income from consumers to dairy farmers.



4. Tend to significantly stabilize the industry, but not to face up to the problem of bringing about an optimum total amount of milk production in the right places at the right times or to bringing about optimum pricing or use of existing supplies of milk.

## DISCUSSION: ECONOMIC EFFECTS OF REGULATION AND PRICE FIXING IN THE MILK INDUSTRY

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As Dr. Brinegar has indicated, the value of his paper is to open up the subject of regulation and price fixing in the milk industry. He arrives at a summary conclusion that regulation and price fixing *can* do the following: (1) alter the prices individual producers receive by as much as 50 percent; (2) tend to cause the average size of handlers and producers to increase; (3) transfer income from consumers to dairy farmers; (4) tend to significantly stabilize the industry; and (5) fail to bring about an optimum total amount of milk production in the right place at the right time. He fails to indicate whether these possible results are for the short run or for the long run.

In the long run, health and license restrictive practices, in and of themselves, cannot and have not altered supply and demand for milk and milk products or where milk is produced. If the restrictive health and license techniques give the local industry a closed market then attempts might be and frequently are made by the price-fixing agency to alter producer prices which, if successful, lead in the short run to the other conclusions Brinegar has listed. However, if and when the "closed market" producer price becomes only slightly higher than that received by neighboring "unprotected" producers, pressure begins to build up to enter the market. A price discrepancy of much less than Brinegar's 50 percent causes changes in the tightness of the closed market, change in the legal authority to operate a closed market or illegal entry into the market. A similar analysis can be made for the case of restrictive health and license techniques that give "favored" marketers the elements of a closed market.

### *National Price Support Programs*

Whether a national milk price support program causes any of the effects indicated by Brinegar as possibilities depends on the level of price supports on milk or milk products relative to what would actually have occurred in the same market without the supports.

If the level of price supports we have had in recent years has transferred income from consumers to dairy farmers then it could have con-

tributed to a failure to bring about an optimum total amount of milk production in the right place at the right time and prices that would otherwise have been paid to producers have been altered. Thus, if the objective is to transfer money from consumers as taxpayers to producers by this method, price supports should be set at a rate that will bring about the desired transfer. However, if the objective is to bring about an optimum total amount of milk production in the right place at the right time either a different level of support or no support program is indicated.

Total milk production and the geography of milk production are materially influenced by the actual level of prices of alternative farm commodities and off farm employment relative to producer milk prices and factor costs. National support prices that are high relative to returns expected from alternative uses of resources will provide uneconomic use of resources.

#### *Federal and State Producer Regulations for Fixing Prices*

Time and space limitations do not permit me to list all the areas of disagreement in Brinegar's paper regarding the economic effects of federal and state milk market order techniques for price fixing. He attributes much of his observed results to class utilization prices used to accumulate producer money and the type of pool used to disperse producer money.

The level of producer class prices in federal milk orders represent the general pattern of use prices in the competitive market at a basing point, Eau Claire, Wisconsin, plus transportation and handling costs to a particular market. In recent years, adjustments from this pattern have had the effect of transferring milk from both regulated and unregulated markets to balance local supply and demand conditions.

Brinegar states that classified pricing "increases the price of fluid milk to consumers, decreases the price of butter and cheese, increases gross and probably net income to milk producers, and brings about a diversion of more resources to the dairy industry than otherwise would have been the case." He cannot show a positive significant statistical correlation between producer class prices for fluid milk, butter or cheese, and the consumer prices for these items in the major federal orders in recent years. Consumer prices vary from 16 to 28 cents per quart in markets where producer prices vary less than 1 cent per quart. Actually, consumer fluid prices in most federal order markets are highly correlated with weekly wages paid industrial workers and with other consumer economic conditions and not with producer class prices. Classified pricing systems, as such, do not increase the price of fluid milk to consumers. It is the level of class prices or flat prices that influence consumer prices.

Federal and state producer price-fixing practices cannot have had any effect on butter and cheese prices. Federal and state orders are con-

cerned with producer milk prices. Butter and cheese marketers and consumers determine consumer butter and cheese prices.

Class pricing, when combined with other features of regulation, has its greatest economic impact by means of its regulation of competition among handlers for producer milk. If the saving in cost of competition is transferred by the regulation to producers then it might be said that class pricing and regulation does "increase producer returns and divert more resources to the dairy industry than otherwise would have been the case." However, the originally regulated producers do not have a closed market and are not able to retain any appreciable saving for any length of time. Producer price relationships do transfer producers from one market to another and do bring about changes in volume of production entering a particular market. Nationally the economic impact so far as aggregate production or consumption and the geography of production or processing is at a very minimum.

Brinegar indicates that regulatory methods used to distribute money from handlers to producers is effective in influencing the geography of milk production, particularly in a milkshed. In the absence of more rigid controls and more effective administrative ability this is an impossibility.

Brinegar indicates that in a marketwide pool, price is largely lost as a tool of supply control while it is still effective in handler type pools. He does not indicate whether the supply is that priced under the particular order or aggregate national or milkshed supply. In any event the effectiveness of price as a total supply tool is no different under either type of order because of the method of pooling. The producer gets the blend price. Changes in class pricing or changes in utilization both influence the producer's blend price. Differences in the effects of marketwide and handler pools are much more closely associated with pool-plant rules, milkshed market conditions, and gentlemen's agreements among marketers than with the type of pool. Some handler pools may appear to balance milkshed supply by sloughing off producers into other markets.

In conclusion, the price of milk is what a producer or a handler can get for it in the market place. Also, milk will be produced, processed and distributed by those individuals and business firms that can do the job at the lowest cost. Regulation and price fixing can and do contribute to the reduction of costs of competition. Regulation and price fixing can only delay or speed up economic changes in a given market for a short period of time and, except for national price support programs, cannot be effective in transferring consumer income to producers or influencing the geography of milk production processing and consumption. So far, our legal and administrative abilities and authority are not as strong as competition in the market place.

# FUTURE PRODUCTION REGIONS FOR POULTRY

Chairman: D. W. Parvin, Mississippi State College

## BROILER PRODUCTION REGIONS OF THE FUTURE\*

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THE commercial broiler industry increased its output by extraordinary proportions during 1956. Broiler prices were depressed to 1941 levels, and profits were sharply reduced throughout the industry. These difficult circumstances continued into the first half of 1957 and aroused considerable interest in the prospects for survival and future growth of the broiler industry in particular production areas. This paper describes the present state of some economic variables that will affect future location of broiler growing and processing. Broadly, the categories of variables to be considered consist of market orientation, factor costs, and industry organization. These variables are considered as they presently affect selected broiler growing regions. The regions considered originated about 70 per cent of total production in 1956 and supplied practically all of the broilers that entered interregional shipments.

### I. MARKET ORIENTATION: UNEQUAL EFFECTS OF LOCATION UPON PROCESSOR'S NET PRICES IN VARIOUS REGIONS<sup>1</sup>

Location of a broiler producing region affects the net prices available to its broiler processors. The most favorable net price available to any processor is the price in his most profitable market, less costs of transporting the product to buyers. The broiler industry of a region is favored by location when its most profitable markets are nearby and highly deficit. Net prices to processors in such a region will be higher than net prices to processors in highly surplus regions that are far from their best markets.

The effect of location upon net prices to processors can be studied by estimating intermarket price differentials in the equilibrium state of the whole marketing system for broilers. Table 1 lists differentials of processors' net prices in selected regions with the processors' net price in North

\* Contribution from the Department of Agricultural Economics, North Carolina Agricultural Experiment Station, Raleigh, North Carolina. Published with the approval of the Director of Research as Paper No. 842 of the Journal Series.

<sup>1</sup> This section of the paper is based on research conducted at North Carolina State College as part of Southern Regional Marketing Project SM-15. Methods used in the study and some of the results have been reported in *North Carolina Broilers in Interregional Competition*, A. E. Information Series 56, Department of Agricultural Economics, North Carolina State College (February, 1957).

TABLE 1. DIFFERENTIALS BETWEEN PROCESSOR'S NET PRICE IN GEORGIA AND NET PRICES IN OTHER REGIONS, BASED ON MARKET EQUILIBRIUM IN 1955

Region	Differential with North Georgia (cents per pound)
Central Maine	+0.58
Eastern Connecticut	+1.11
Southeastern Pennsylvania	+0.49
Delmarva	+0.96
Northwest Virginia	+0.72
Central North Carolina	+0.58
North Alabama	+0.09
Central Mississippi	+0.50
Northwest Arkansas	+0.27
East Texas	+0.23

Georgia, based on a study of the equilibrium state of the national broiler market in 1955.

Location advantage is greatest for a region located near a highly deficient consuming area as exemplified in the case of Connecticut. Location advantage is least for a highly surplus area serving many distant markets as is true of Georgia. Location advantages are small relative to the prices of broilers because transportation charges are small relative to the prices, and because production areas with surplus broilers are widely distributed. However, location advantage gains in prominence if the prices of broilers fall and transportation costs do not.

Location advantages in marketing will affect future development of the broiler industry. Present advantages, as listed in Table 1, tend to encourage growth of the industry in the favored regions. Perhaps less obvious, the development of the industry causes changes in these location advantages. For example, location advantage may be increased in the case of a region selling to a market that has a rapidly increasing demand; in such a market, the price may rise to attract broilers from a wider area. Arkansas and Texas have been so favored by rapid population growth on the West Coast in recent years. On the other hand, location advantage may be decreased in the case of a region that has a rapidly increasing supply; increased shipments from such a region may lower the price in its best market so that shipment to additional markets becomes equally profitable. Georgia and Alabama have extended their shipping areas in this way during recent years.

## II. FACTOR COSTS: DIFFERENCES AMONG REGIONS IN COSTS OF INPUTS FOR THE BROILER INDUSTRY

The broiler industry of a region must pay enough for factors of production to attract them from alternate uses. The necessary prices for particular factors differ among regions. Also, the quantities of particular factors required to produce each pound of broilers may vary among regions be-



TABLE 2. ESTIMATED DIFFERENTIALS IN COST OF SELECTED INPUTS FOR THE BROILER INDUSTRY, SELECTED REGIONS CONTRASTED WITH NORTH GEORGIA, IN CENTS PER POUND

Area	Cents per live pound				Total of first four items converted to Processed wt. basis	Labor (processing)	Total differential in costs	Differential adjusted for location advantage
	Feed	Chicks	Labor (growing)	Fuel (brooding)				
Maine	+0.90	+0.29	+0.08	+0.27	+2.14	+0.17	+2.31	+1.73
Connecticut	+0.86	+0.47	+0.28	+0.17	+2.47	+0.61	+3.08	+1.97
Pennsylvania	+0.48	+0.52	+0.25	+0.10	+1.87	+0.56	+2.43	+1.94
Delmarva	+0.26	+0.12	+0.24	+0.17	+1.37	+0.53	+1.90	+0.94
Virginia	+0.62	+0.24	+0.05	+0.07	+1.35	+0.11	+1.46	+0.74
N. Carolina	+0.41	+0.10	-0.11	+0.02	+0.58	-0.14	+0.44	-0.14
Alabama	+0.25	+0.15	+0.02	0.00	+0.54	-0.05	+0.53	+0.44
Mississippi	+0.25	+0.23	-0.05	-0.04	+0.54	-0.11	+0.43	-0.07
Arkansas	+0.15	+0.57	-0.02	+0.02	+1.00	-0.04	+0.96	+0.69
Texas	+0.24	+0.23	+0.24	-0.05	+0.92	+0.53	+1.45	+1.22

cause of technological differences due to climate. This section is an examination of regional differences in factor costs with local charges for credit and distribution ignored insofar as possible.

#### A. Feed

Feed cost advantage is obtained at the rate of 0.125 cents per live pound for each \$1.00 per ton advantage in the price of feed (assuming a feed-weight conversion ratio of 2.5). Prices of broiler mash at the various mills of two national companies were obtained in May and June of this year. Regional prices for each company were converted into differentials from the price in North Georgia, differentials for the two companies were averaged for each of the regions, and the results were converted into production cost differentials as listed in the first column of Table 2. In general, the states from Arkansas to Georgia have feed cost advantages over states on the Atlantic Coast.

#### B. Chicks

Assuming broilers are grown to an average weight of 3.2 pounds, a difference of 1 cent per bird in the price of baby chicks corresponds to a difference of 0.313 cents per live pound in costs of production. During recent months, Georgia has had the lowest prices for baby chicks of any broiler growing state. Prices received by hatcheries for broiler-type baby chicks during the first six months of 1957, as reported in *Agricultural Prices*, were converted into regional differentials with Georgia as the base. Regional differentials in chick prices were then converted into differences in broiler production costs; these differences are listed in the second column of Table 2.

#### C. Labor for Growing

Over the long run, the return to labor in broiler growing must be competitive with the return in alternative employments to keep growers

in the industry. The competing alternative for the labor of a typical broiler grower is probably off-farm employment as a production worker in manufacturing. Other farm enterprises also compete.

Now, we propose a broiler enterprise that would provide full-time employment for two men that are also suited to production work in manufacturing. This enterprise consists of housing and equipment for 60,000 birds, with 12,000 started every two weeks, and has an average weekly output of 19,200 live pounds. A variation of \$10.00 in the weekly wage for both workers corresponds to a variation of 0.104 cent per live pound in cost of production.

Average weekly earnings of production workers in manufacturing during the first quarter of 1957, as reported for various states in *Employment and Earnings*, were converted into differentials with Georgia as a base. These differentials were then converted into differences in costs of production per live pound on the basis of the relation developed above. The differences due to labor cost are listed in the third column of Table 2. Only three states, Arkansas, Mississippi and North Carolina, have lower opportunity costs for labor than Georgia.

#### D. Fuel

An estimate of regional differences in brooding costs was prepared in the following way. Fuel oil was assumed to be competitive with other fuels in cost per B.T.U., regardless of location. B.T.U. requirements for brooding were assumed to be a linear function of the degree-days on a base of 65°F. (an assumption that is said to work fairly well when applied to B.T.U. requirements for household heating). Next, wholesale fuel oil prices in the center of the various regions were converted into percentages of the price in Central North Carolina, and degree-days in various regions were converted into percentages of the number of degree-days in North Carolina. The cost of oil brooding in North Carolina was estimated on the basis of recent data for year-round production costs and the costs in other regions were estimated by using the percentage factors of the preceding step. The resulting estimate of brooding cost in Maine was checked against recent data and the procedure was judged to give a fairly close estimate when projected into extreme weather conditions. Estimated costs of brooding in the various regions were converted into production-cost differentials, with North Georgia as the base, and are listed in the fourth column of Table 2.

#### E. Housing and Equipment

Initial investment in similar equipment would not be expected to differ much among the regions. Initial investment in housing does differ,

generally increasing as winter temperatures become more severe. However, the most expensive housing used in colder climates has a longer life. Differences in production costs per pound due to differences in housing and equipment costs are believed to be very small.

#### F. Inputs Used in Processing<sup>2</sup>

Table 3 is a listing of estimated in-plant processing costs for North Carolina. The estimates are based on operation of a model 4,800 bird per hour plant that has highly efficient equipment and layout. The plant is assumed to be operated 40 hours per week.

Trademarked packaging materials are important cost items, but the

TABLE 3. ESTIMATED IN-PLANT PROCESSING COSTS IN CENTS PER POUND (NORTH CAROLINA MODEL PLANT)

Item	Cost	Per Cent
Wages and salaries	1.448	47.1
Fuel, water, electricity	0.180	5.9
Packaging materials	1.000	32.5
Repairs, workers uniforms, office supplies	0.110	3.6
Interest and depreciation	0.310	10.1
Taxes and insurance	0.025	0.8
Total	3.073	100.0

cost of such materials is unlikely to vary significantly among regions. The plants in different regions may purchase such materials from a common source, and competition in the packaging industry is very keen.

About 78 per cent of the interest and depreciation costs are due to processing equipment. Most of this equipment is sold by two manufacturers, and freight constitutes a very small part of cost of this equipment. The investment in processing equipment is unlikely to vary significantly from one region to another.

On the basis of Table 3 and the above discussion, it appears that differences in labor costs would be the most important source of variation among regions in processing costs. Labor requirements in the plant described in Table 2 are estimated at 1.24 hours per 100 pounds of output. A variation of 10 cents in the hourly wage rate thus corresponds to a variation of 0.124 cent per pound in the cost of processing.

Labor used in processing plants appears to require less skill and basic education than production work in manufacturing on the average. Processing labor tends to cost about 75 per cent as much as production labor for manufacturing in the same area. This ratio was used to estimate

<sup>2</sup> The discussion in this part of the paper is based on *Broiler Processing Costs*, James Donald and C. E. Bishop, A. E. Information Series 59, Department of Agricultural Economics, N. C. State College, June, 1957.

regional differences in costs of processing poultry. The differences, with North Georgia as a base, are listed in Column 6 of Table 2.

### *G. Factor Costs and Location Advantages Combined*

The final column of Table 2 was obtained by summing the factor cost differentials and then offsetting the higher costs of the various regions by their location advantages. It may be seen that the net effect is to give Texas, Pennsylvania, Connecticut, and Maine disadvantages amounting to one cent per pound or more, as compared with Georgia. Mississippi and North Carolina emerge with small advantages over Georgia. Delmarva, Virginia, Arkansas, and Alabama have disadvantages amounting to less than one cent per processed pound.

### III. INDUSTRY ORGANIZATION: ECONOMIES TO SCALE, ECONOMIES IN SPATIAL CONCENTRATION, AND ECONOMIES OF INTEGRATED MANAGEMENT

The above analysis suggests that the existing broiler regions are not equally suited to broiler production and marketing when location forces and factor costs are considered together. It does not follow that disadvantaged regions will necessarily lose their broiler industry in the future. Economies in organization of the industry might enable continued success in production and marketing of broilers. Unfortunately, few studies of these economies have been performed. This section points out areas where such economies may exist and reviews available evidence as to the status of industry organization in the various regions.

#### *A. Internal Economies to Scale*

Internal economies associated with buildings and equipment at the grower level appear to be relatively unimportant in studies at North Carolina. Increasing the size of housing units offers practically no reduction in cost per unit after a capacity of 10,000 birds in one unit is reached. However, a full-time broiler grower may be considered as a "lumpy" input with a fixed cost at the level of the labor income available to him in alternative employment. Under such circumstances, per unit costs of production are reduced as the housing and equipment capacity controlled by the grower are increased. Table 4 shows the relation between capacity and labor cost per live pound when two levels of annual labor income are assumed to be necessary.

Let us now compare regions as to the scale of production at the growing level as indicated in the 1954 Census of Agriculture. These regions were formed by grouping all counties that reported one million or more broilers sold and for which one half or more of the land area was included within a distance of fifty miles from the center of broiler production. The

TABLE 4. LABOR RETURN PER POUND NECESSARY TO PROVIDE ANNUAL LABOR INCOME FROM BROILER GROWING AT TWO LEVELS WITH VARIOUS HOUSING CAPACITIES\*

Housing capacity (number of birds)	Necessary labor income in cents per pound	
	\$2,400 annually	\$3,600 annually
3,000	5.52	8.28
6,000	2.76	4.14
12,000	1.38	2.07
24,000	.69	1.03
48,000	.34	.52

\* Based on production of 14.5 live pounds per bird of housing capacity per year.

average number of broilers sold per farm reporting broiler sales is listed for the various regions in the first column of Table 5. Maine, Delmarva, and Mississippi appear to have had about twice as much capacity per grower as did Georgia in 1954. Connecticut and Alabama also had considerably more capacity. Part of the explanation for survival of the broiler industry in the northeastern United States, and part of the explanation for rapid expansion of the broiler industry in Mississippi and Alabama may be in their relatively larger scale of production at the broiler growing level.

Poultry processing plants exhibit internal economies to scale due to sharing of managerial overhead, more efficient use of buildings and equipment, and more efficient use of production labor. Table 6 summarizes the

TABLE 5. SOME CHARACTERISTICS OF THIRTEEN AREAS OF CONCENTRATED BROILER PRODUCTION

Area	Average number broilers sold per farm (1954)	Total broilers sold in 1954	Broilers per square mile	Percent farms reporting broilers	Average value of buildings & equipment per farm	Number of counties with 10 million broilers per year
	(nearest thousand)	(millions)	(nearest hundred)		(nearest hundred)	
Belfast (Me.) <sup>a</sup>	29,000	17.6	1,800	7.0	\$ 8,300	0
Putnam (Conn.) <sup>b</sup>	23,000	18.1	4,500	8.1	16,700	0
Salisbury (Del.-Md.) <sup>c</sup>	37,000	107.7	28,300	24.6	15,500	3
Lancaster (Pa.) <sup>d</sup>	11,000	9.9	3,200	5.1	23,600	0
Harrisonburg (Va.) <sup>e</sup>	10,000	29.7	6,700	24.2	12,300	1
Robbins (N. C.) <sup>f</sup>	13,000	15.4	5,800	12.0	6,500	0
N. Wilkesboro (N. C.) <sup>g</sup>	9,000	4.8	6,200	13.0	5,100	0
Center (Texas) <sup>h</sup>	16,000	17.5	4,200	9.4	6,900	0
Forest (Miss.) <sup>i</sup>	32,000	18.4	5,700	3.8	5,600	0
Fayetteville (Ark.) <sup>j</sup>	17,000	42.5	9,300	15.7	7,700	2
Cullman (Ala.) <sup>k</sup>	23,000	16.7	5,300	3.7	6,400	0
Gainesville (Ga.) <sup>l</sup>	13,000	85.5	4,700	23.6	6,600	3

<sup>a</sup> Waldo, Knox, Kennebec, Penobscot, Somerset.

<sup>b</sup> Windham, New London, Tolland, Worcester (Mass.), Washington (R. I.).

<sup>c</sup> Kent, Sussex, Caroline, Talbot, Wicomico, Somerset, Worcester, Accomac (Va.).

<sup>d</sup> Lancaster, Chester, Berks, Adams.

<sup>e</sup> Rockingham, Shenandoah, Page, Augusta, Pendleton (W. Va.), Grant (W. Va.), Hardy (W. Va.).

<sup>f</sup> Chatham, Moore, Montgomery, Randolph.

<sup>g</sup> Wilkes.

<sup>h</sup> Shelby, Sabine, Nacogdoches, Rusk, Danola.

<sup>i</sup> Leake, Smith, Scott, Simpson, Rankin.

<sup>j</sup> Benton, Carroll, Madison, Washington, Delaware (Okla.), McDonald (Okla.).

<sup>k</sup> Marshall, Jefferson, Walker, Winston, Cullman.

<sup>l</sup> Gilmer, Pickens, Cherokee, Cobb, Fulton, Gwinnet, Forsyth, Dawson, Lampkin, Jackson, Barrow, White, Stephens, Habersham, Hill, Bands, Franklin, Hart, Madison.



estimates for cost of processing in model North Carolina plants designed for three different volumes of output.

The reduction in cost of in-plant processing between the 2,400 bird-per-hour (b.p.h.) and the 4,800 b.p.h. plants is 0.165 cent per pound. The larger plant can process about 9.9 million birds per year when operated 40 hours per week. On the basis of column 2 in Table 5, the total number of broilers processed within 50 miles of the central point was sufficient in 1954 to support one or more 4,800 b.p.h. plants in all the regions except one. (This region in northern North Carolina now has enough broilers to support at least two processing plants of the size in question.)

There is some evidence as to internal economies of scale in by-product

TABLE 6. ESTIMATED IN-PLANT PROCESSING COSTS IN CENTS PER POUND FOR MODEL PLANTS\*

Cost item	Plant capacity (birds per hour)		
	600	2,400	4,800
Wages and salaries	1.979	1.548	1.448
Fuel, water, and electricity	.244	.194	.180
Packaging materials	1.000	1.000	1.000
Repairs, office supplies, uniforms	.124	.117	.110
Interest and depreciation	.430	.349	.310
Taxes and insurance	.032	.030	.025
Total	3.809	3.238	3.073

\* Donald and Bishop, *op. cit.*

rendering plants. A recent study concluded that returns from investment in such rendering plants become attractive when slaughter volume reaches 500,000 pounds of live weight per week (or about 8,125,000 birds per year).<sup>3</sup> Depending upon the market for by-products, a rendering operation based on by-products from a 4,800 bird-per-hour processing plant could be expected to show a profit on the order of one-fourth to one-third of a cent per processed pound of poultry. On the other hand, a rendering plant integrated with a 2,400 bird-per-hour plant could hardly do better than break even.

Other operations in which economies to scale may exist are hatcheries, feed distribution, live hauling, and hauling processed birds to market. In general, it appears possible to develop efficient single firms to perform these services on the basis of less volume than can be processed in a single large processing plant. One can conclude that the volume of production in practically all of the existing areas is sufficient to allow exploitation of internal economies to scale in the broiler industry. However, the

<sup>3</sup> *Processing Poultry By-Products in Poultry Slaughtering Plants*, Marketing Research Report No. 181, Agricultural Marketing Service, USDA, Washington, D. C.

radius of transportation required to assemble birds for processing is as much as fifty miles in some of the regions. Also, the existence of sufficient volume yields no benefit unless the industry is organized into the larger firms.

### B. Economies of Spatial Concentration

Feed distribution and processing of marketable broilers are generally performed at a centrally located point. Costs of providing these services would be decreased as density of production within the area is increased.

Table 7 shows the relation of selected costs of feed hauling and live-hauling to production density. In the construction of Table 7 a circular

TABLE 7. RELATION OF PRODUCTION DENSITY TO SELECTED COSTS FOR FEED HAULING AND LIVE HAULING IN A BROILER AREA. ASSUMED: 9.9 MILLION BROILERS PER YEAR FED AND PROCESSED AROUND ONE CENTRAL POINT

Density (broilers/ sq. mile/ year)	Average road distance to broilers (miles)	Feed hauling (cents per live pound processed)	Live hauling costs (cents per live pound)			Total costs converted to cents per processed pound	Reduction over next lower density
			Labor	Variable truck	Drift		
1,000	72.8	.587	.330	.101	.458	2.050	—
2,000	51.5	.440	.228	.072	.358	1.525	.525
3,000	42.1	.370	.200	.058	.313	1.307	.218
4,000	36.6	.337	.187	.051	.287	1.197	.110
5,000	32.7	.310	.179	.045	.269	1.115	.082
6,000	29.9	.290	.173	.042	.256	1.057	.058
8,000	26.0	.262	.166	.036	.238	.975	.082
10,000	23.3	.245	.161	.032	.225	.921	.054
15,000	19.0	.215	.155	.026	.204	.833	.088
30,000	13.6	.178	.147	.019	.178	.725	.108

supply area producing 9.9 million broilers per year for a centrally located processing plant is assumed. The costs are based on preliminary findings of North Carolina studies. Costs in other broiler producing areas might be somewhat different. However, the general relationships of costs to density would be similar.

The estimating procedures yielded relations between production density and costs of feed hauling and live hauling as shown in Table 7. On the basis of Table 7 and the third column of Table 5, it may be suggested that two areas have considerable advantages over Georgia in their production density. These are: Delmarva, where the advantage is approximately 0.38 cent per processed pound, and Arkansas, where the advantage is approximately 0.16 cent per processed pound. Since about 1 in 4 farms are growing broilers in each of the above areas, the density advantage of Delmarva and Arkansas is largely the result of having more broilers per grower. Increasing density by increasing capacity per grower is a difficult task because capital limitations are encountered. At present costs, upwards of 75 cents per bird is required for new housing and equipment in the southern states (if automatic feeders are installed). Column 5

shows the average total value of buildings and equipment on farms in the various regions. Connecticut and Virginia appear to have farms with mortgage capabilities that would allow relatively high capitalization at the broiler growing level.

### *C. Economies of Integrated Management*

Much talk is heard these days of vertical integration in the broiler industry. Presumably, the practice is spreading because of advantages gained by the integrated firms. No studies of these advantages have been published and we can only guess about the economies that would be achieved.

The sources of these economies are:

(1) Establishment of a stable volume of business at the capacity for which firms were organized. Costs per unit are considerably higher when processing plants are operated at less than design capacity.

(2) Elimination of many transactions. Conceivably, less management may be required, since time spent in searching for transactions is also eliminated.

(3) Spreading of overhead. The cost of administration for the integrated scheme is almost certainly reduced independently of the saving in transactions time.

Maine is noted for integration of its broiler industry. Six contractors and five processing plants are said to account for the broiler output of the entire state. Mississippi has perhaps the largest single integrated firm in the broiler industry. The practice of integration is likely to continue in all areas.

### IV. CONCLUSION

Location advantages, factor costs, and economies of industrial organization have been considered. Although neither location advantages nor factor costs are permanent, the present state of economic development in the nation tends to favor growth of the broiler industry in the area from Virginia to Arkansas as opposed to the area from Delmarva to Maine. A principal point to be considered is the alternative opportunities for labor in the various broiler areas. Unless such opportunities improve in North Carolina and Mississippi, the broiler areas of these states are likely to continue expanding even after the rate of expansion in Georgia and Alabama is decreased.

Economies in organization of the broiler industry are probably the explanation for continued production of broilers in the northeastern United States. Scale of production at the individual grower level is relatively high for Maine, Connecticut, and Delmarva. In addition, the

Delmarva region has unmatched density of production. Economies in organization can also be achieved in the South. Alabama and Mississippi are relatively high in scale at the grower level and Arkansas has relatively high density. A principal handicap to the southern states in obtaining economies in organization of the industry is limitation of capital. If this limitation is overcome, the broiler production regions of the future are likely to be in the southern states. The distribution of regions within the South would then be determined largely by labor opportunities in alternative employment. Generally, the less rapid the industrial development of a southern state, the more likely it would be to emerge as part of a leading broiler region.

### DISCUSSION: BROILER PRODUCTION REGIONS OF THE FUTURE

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Dr. Henry is to be commended on at least two points: (1) he has been realistic in the basic data he used and (2) he has covered the major factors that should be used in determining the various aspects of inter-regional competition.

I can, however, pick at him for failure to discuss several important points. First, he has almost totally ignored discussing why the major grain producing areas have not developed broiler production. He more or less dismisses this lack of development by the term "better alternative opportunities." Perhaps he is right, but I believe there needs to be a fuller discussion of this subject. Secondly, he does not give enough emphasis to the fact that the whole South is in a state of transition. Farmers are moving out of cotton, tobacco, and peanuts and into poultry, livestock and industry. Most of the farms are small and poultry is the most logical phase for them to move into. The soil bank program is accelerating this movement. It pays farmers to get out of crop farming and this capital can be used to build poultry houses. We see this especially in south Georgia.

In trying to equate receipts from the broiler farm and factory wages, Henry does not make allowances for cost of getting to and from work, food and clothing, etc. In some cases, people travel 100 miles a day to and from Atlanta, and this is a deduction from their wages. Also, some economists often forget the place of women in the broiler economy. Whereas women rarely ever plant cotton, they often feed and water broilers.

I would argue with Henry about equating all fuel to a fuel-oil base.

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In actual practice, fuel oil is a more expensive form of heat, especially in Georgia where the winters are not severe. Also in figuring housing costs, he gives too much weight to the lower long-run cost of the better built broiler houses. Where capital is at a premium initial costs are all important. There is no difference in the annual cost of a house that lasts only ten years as compared with one lasting twenty years and having twice the initial cost. The initial cost, however, is extremely important, especially when one considers that the capacity can be doubled with the less expensive house.

In Table 4 Henry shows the labor return per pound necessary to provide an annual labor income with various housing capacities. Actually this can be misleading unless it is studied very carefully. Under most contracts, the return to labor is not separated from the return on investment, housing, etc. For example, a broiler grower with a house of 12,000 capacity would need to receive about 2.38 cents per pound in order to have a labor income of \$2,400 annually and 3.07 cents to have \$3,600.

Henry dwells at length on the effect of spatial concentration on cost. He is absolutely right in his analysis, although he has failed to bring his data up to date. Units in the southeast have increased greatly in size during the past four years. This has had the effect of greatly increasing the density of broilers grown in the area. Below is given the broiler capacities of 150 broiler growers under contract during August 1957.

<i>Broiler housing capacity</i>	<i>No. of farms</i>	<i>Percent of total</i>
Less than 5,000	36	24
5,000- 9,999	61	41
10,000-19,999	42	28
20,000-29,999	5	3
30,000 and over	6	4
	<hr/> 150	<hr/> 100

The average capacity for this group of broiler growers is about 10,300 which, if one assumes 4 broods per year, means that more than 40,000 broilers are sold per farm. This is three times the 1954 census figure for Gainesville, Georgia and about the same as in the Delmarva area.

I believe Henry is right when he says that the southeast will expand broiler production in the future. As the units grow larger, the advantages now held by Maine and Delmarva will largely disappear. Continued increase in the production of corn and soybeans will lower feed costs even further. As the industry grows more concentrated, all costs will tend to be lowered. Because of federal inspection, processing costs will temporarily be increased but because plants will have to be renovated or rebuilt, the processing phase may become even more efficient than in the older plants in other parts of the country.



## COMMERCIAL EGG PRODUCTION REGIONS OF THE FUTURE

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THE location of commercial egg production in the future will be dependent upon relative costs of production, both in terms of direct and opportunity costs in relation to the local demand for eggs.<sup>1</sup> Location of consumer demand will be closely associated with location of population. Research by the United States Department of Agriculture indicates that in the spring of 1955, average per capita egg consumption differed little among regions of the United States. The Western states had both the highest average per capita number and value of eggs consumed. The average quantity per person was lowest in the Northeast while the average value was lowest in the North Central region.<sup>2</sup>

Cost of producing eggs is dependent in part on size of flock. The average cost of producing eggs increases as flock size increases from the small flock which reproduces itself, finds its own feed and shelter, to the size where the feed is mostly purchased and there are alternative employments for labor. Then the per unit cost decreases. We are not sure at what point per unit costs tend to level off. One indication is at about 3,000 birds under present organizational setups.<sup>3</sup> Equipment not now generally used in egg production possibly will result in decreasing average cost until flock size reaches 100,000 birds or more. In this paper we are interested only in decreasing or constant per unit costs.

Judge has done a good job of developing the problem of location of production in relation to consumption of eggs.<sup>4</sup> His study is useful as a first approximation to the real situation. His model was made manageable through the use of twelve regions and points within the regions as markets and supply sources, with a perfectly competitive market. Thus only transportation and handling costs caused differences among prices at the various locations. He also assumed that eggs were homogeneous. Transportation rates for contract and common carrier trucks were used. This necessarily assumed away many complicating variables such as

<sup>1</sup> Local demand means demand by local buyers whether for consumption within or outside the region in which produced. Local is used to denote the existence of the necessary facilities to create effective demand.

<sup>2</sup> *Food Consumption of Households By Regions of the United States*, U.S. Department of Agriculture, Washington, December 1956. Reports 2, 3, 4, and 5.

<sup>3</sup> A. D. Reed, Extension Economist, University of California, Davis, personal communication, June 5, 1957.

<sup>4</sup> George G. Judge, *Competitive Position of the Connecticut Poultry Industry*, No. 7, *A Spatial Equilibrium Model For Eggs*, Storrs Agricultural Experiment Station, Bulletin 318, January, 1956.

differences in average quality of eggs among production locations, variation in transportation costs depending upon kind of carrier used, variation in marketing costs resulting from economies of scale at the farm and in assembly, different institutional factors and attitude of producers and market operators toward change.

If these variables are important much of the solution of location of commercial egg production must rest on opinion rather on the precision of the mathematical model and the function of this paper to present more of this artisan's point of view. The acceptance or rejection of the ideas presented here must be based upon the reader's subjective evaluation of the problem.<sup>5</sup>

### *Kinds of Production in the Future*

We shall divide producers into two groups, type A and type B.

Type A will produce eggs of uniformly high quality and at a uniform level throughout the year. (1) Chickens will produce eggs of uniformly high quality. (2) Feeding will produce uniform yolk color. Yolk color may be darker than present grading standards permit in top quality eggs. Uniformity may be more important than degree of color. (3) Houses will permit a maximum of capital substitution for labor. (4) Eggs will be conveyed to a cleaning station immediately after being laid. They will then be cooled immediately.<sup>6</sup> (5) Sizing will be done on the line as the eggs come from either the laying house or the cooling tunnel. Eggs may be run over a blood-spot detector and a shell-soundness detector, visually inspected and then cartoned automatically, or they will move to an assembly-distribution plant where they will be size-graded. Grading at the plant, in addition to blood spot and shell soundness detection, will consist of visual exterior inspection and perhaps a cursory inspection of interior quality as the eggs move over a light.

In the retail store, offerings of eggs will be of various sizes. All eggs will be of approximately the same high interior quality. There will be longer be AA, A and B grades for these eggs but the differentiation will

<sup>5</sup> Particularly helpful ideas were obtained from Professor William H. Thompson and Leonard Z. Eggleton of Iowa State College, William H. Dankers and Cora Cooke of the University of Minnesota, Joe W. Koudele of Kansas State College, A. D. Reed of the University of California, Charles K. Laurent of the University of Georgia and A. K. Birth, G. O. Bressler, and Herman Southworth of the Pennsylvania State University; Charles H. Ratjen of the Chicago Military Subsistence Market Center; H. I. Miller, David Hume and Richard C. Larkin of the Poultry Division of U.S. Department of Agriculture; A. V. Scollard and J. A. Cady of the Brentwood Egg Company (Safety Stores); and W. W. Densford of the Kroger Company.

<sup>6</sup> The author does not know of a working automatic egg gatherer and cleaner but if such is not already in operation it undoubtedly will be perfected soon since three-fourths or more of the normal chore labor is consumed in gathering, cleaning and packing eggs.

be on the basis of egg sizes. The proportions of various sizes of eggs will be controlled by multi-additions to the laying flocks during the year to produce an even seasonal flow. As a result of this kind of program there will be a general trend toward consumers buying a larger proportion of eggs from the retail stores with programs that guarantee the broken-out quality of eggs. Many consumers report buying eggs from sources other than regular retail stores because they can get better quality or fresher eggs when buying directly from producers.<sup>7</sup>

These eggs will be sold largely through the large chains, on dairy routes and by some of the smaller chains and occasional independents. Some may move directly to consumers. Producers whose eggs do not meet the necessary requirements for Type A eggs will likely be dropped from the program or their eggs will be candled and lower prices paid for the eggs.

Type B producers will continue to follow patterns much like those in general existence today. There will be variations in quality from producer to producer. The eggs will need to be candled to separate them into A, B and C categories, or the eggs will be sold directly to consumers. Some retailers will buy directly from producers in their area, others will buy from smaller assemblers and some from larger assemblers.

Direct sale to consumers will continue to be important for this group particularly in areas where type A eggs will not be generally available. Sales will be made (a) by door-to-door delivery, (b) through vending machines at appropriate farm and nonfarm locations and (c) at the roadside stand type of operation.

Some consumers will continue to believe that their best bet for getting good eggs is to buy them directly from producers. More producers will refrigerate their eggs for these outlets.

Morrison and Seaver<sup>8</sup> found that the average cost of delivering eggs to consumers in Connecticut was 10.1 cents per dozen. This included wages at \$1.79 per hour. However, the average margin taken above the wholesale jobbing price was 15 cents per dozen or \$3.03 per hour.

Type B eggs are also likely to go to institutional users. Some restaurants and hotels will want to be guaranteed a uniform product and will obtain

<sup>7</sup> A. William Jasper, *Some Highlights From Consumer Egg Studies*, Agricultural Information, Bulletin No. 110, U.S. Department of Agriculture, June 1953. R. L. Kohls, and Norman Oppenheimer, *Quality Recognition of Purchasing Habits of Egg Consumers*, Purdue Agricultural Experiment Station, Bulletin 592, July 1953. Walter L. Slocum, and Howard S. Swanson, *Egg Consumption Habits, Purchasing Patterns and Preferences of Seattle Consumers*, Washington Agricultural Experiment Station Bulletin 556, December 1954.

<sup>8</sup> T. C. Morrison and S. K. Seaver, *Competitive Position of the Connecticut Poultry Industry, No. 6 Operation of Retail Egg Routes—Actual and Theoretical Applications*, Storrs Agricultural Experiment Station Bulletin 310, April 1954.

their supplies from type A producers. The restaurants not quite as quality-conscious will get some eggs directly from type B producers. Others will get them from city wholesalers. These institutional outlets may be one of the last straws for which many city wholesalers will be grasping.

Relatively good frozen and dried egg solids may be manufactured from eggs produced by type B producers. These eggs will come almost wholly from the Midwest. Some dried egg solids may be packaged from this group for direct sale to consumers much as dried albumen is now being included in angel-cake mixes.

Another major outlet for type B producers will be the armed forces. Eggs of high enough quality to meet the armed forces specifications will be fairly easily obtained from these producers. The packers in the present surplus areas of the Midwest will undoubtedly continue to supply this business. Costs in other areas will have to get extremely low to force these people out of business. The channel for this type of outlet will be largely producer to assembler to military forces.

#### *Areas Which Will Supply Program Eggs*

(1) Much of the total egg consumption of the Far West, particularly in the Pacific Coast states, will be supplied by type A eggs. The area is already rapidly moving in that direction. (2) The South Atlantic and eventually the South Central states may supply their own needs for this kind of eggs. (3) In the Midwest, particularly the West North Central states, the most important egg producing areas are also among the best general farming areas. The alternatives are good in these areas. Therefore, we would not expect a large quantity of type A eggs to be produced. Much of the present Midwest advantages in feed cost will likely be dissipated if producers feed for uniform yolk color. Commercial laying mashers sell about as high in the Midwest as in the deficit feed areas.<sup>9</sup>

Addition of capital equipment will permit lower labor costs in the Midwest. The West North Central states likely will continue to have surplus eggs, and for some time will ship eggs to the South Central and South Atlantic states as well as to the Northeast. (4) The Northeast will supply a large percentage of type B eggs for their own area. The rapidity with which they supply type A eggs will depend upon acceptance of supervision and new techniques. It is probable, in the long run, that most of the type A eggs for consumption in this area will be supplied by producers in the area. But it may be harder for producers who are already

<sup>9</sup> See *Agricultural Prices*, AMS, U.S. Department of Agriculture. For instance, in May 1957, average regional prices for laying mash ranged from \$4.30 per 100 pounds in the West North Central states to \$4.77 in the South Atlantic states. Prices varied considerably within regions.

following a particular pattern to change than producers who have not established so-called production know-how. Many producers in the South may be more amenable to suggestions and supervision than those who have been in the egg business longer.

### *Technological Change*

No geographical division of the country will have a monopoly on technical know-how. The only question is which areas adopt these practices sooner. Judge, Seaver, and Henry have indicated that for the purposes of interpretation of interregional competition that technical change may be classified as follows: (1) biological, (2) mechanical, and (3) organizational.<sup>10</sup> No area will have a great advantage over another in biological advances, such as changes in the genetic make-up of hens which permit them to lay both large numbers and high quality eggs, or in feeds which result in increased production of eggs per unit of feed. However, a decline in the pounds of feed required to produce a dozen eggs should work to the advantage of deficit feed areas. Less feed will need to be shipped in to produce the same quantity of eggs. The possibilities for reduction of production costs appear greatest in the biological area.

Mechanical innovations will undoubtedly be important and the differentials among areas and within areas are likely to be great. This is largely a matter of developing means of substituting capital for labor and will consist of wholly automatic equipment as against hand labor. Controlled environment houses will be partially a matter of mechanical innovation. More birds will likely be housed per square foot of floor space.<sup>11</sup>

In order to bring about these changes there will need to be an alleviation of the problem of capital rationing at the producer level. This means an industry-wide re-organization. In order to supply the capital it may be necessary for more vertically integrated types of production to come to the fore. This will permit the production of type A eggs which in turn will lower marketing costs to the retail level.

Birth and Hughes have indicated some reasons for vertically integrated programs.<sup>12</sup> (1) Farm income has been low in some areas. The drouth

<sup>10</sup> George G. Judge, S. K. Seaver and W. F. Henry, *Competitive Position of Connecticut Poultry Industry, No. 1. Economic Interpretations of Interregional Competition*, Storrs Agricultural Experiment Station, Bulletin 309, February 1954.

<sup>11</sup> G. O. Bressler, *A Progress Report on the Penn State Solar Poultry House*, Mimeo Report, Department of Poultry Husbandry, The Pennsylvania State University, March 1957.

<sup>12</sup> Kennit Birth, and Fred Hughes, *Industry Financing of Egg Production*, Mimeo-graphed Report to County Extension Workers, Pennsylvania Agricultural Extension Service, 1957.



has resulted in poor pastures and reduced income from cattle. Egg production offers a possibility of a new source of income.<sup>13</sup> (2) Cash operating expenses in the poultry business are large. A sizeable amount of working capital is required for feed and chicks. Many farmers are unable to obtain this credit from usual sources. Industry financing is helping new producers to start and others to expand. (3) The abundance of feed and competition among companies to sell feed encouraged these programs. (4) In modern merchandising, consumer demand has brought emphasis on quality. (5) With many large flocks in the financing program, assembly costs can be reduced permitting more frequent marketing of eggs, quality control, and reduction of grading costs. (6) Financing the programs transfers some or all of the risk to the financing agency. (7) Poultry enterprises require a great deal of managerial ability to be successful. Management assistance helps overcome some of this problem.

#### *Justifications of Regional Expectations*

The expectation of the production of type A eggs is based upon two considerations. (1) Many retailers want to supply their customers with eggs of guaranteed quality. They do not wish to pay prices for these eggs that will force their retail price to be much higher than that of their competitors.<sup>14</sup> (2) Economies of scale apply not only to production at the farm level but also at the assembly-distribution level. Quality control at the farm will permit the lowering of grading costs in market channels. With control of production practices which lead to standardized quality

<sup>13</sup> Since the financing article was written, the present author has received a letter (June 28, 1957) from Joe W. Koudele, Kansas State College concerning the caged layer operations at Kansas. "Originally around 600 caged layer houses each with 1,680 layers were planned. Up to the present approximately 210 contracts (representing the same number of houses) have been signed by one firm. A big feature of this particular financing plan in Kansas is the minimum guaranteed price of 37 cents per dozen or 2 cents per dozen above the current market price for Grade A Large eggs. The marketing firm guaranteeing this price has been losing money on these eggs under the existing market situation. Hence, no new contracts are being signed currently although additional caged plants may be started after assured market outlets have been established. The initial great enthusiasm has waned since the drouth is now considered officially broken in Kansas, and normal yields of wheat and other crops are expected again. Consequently fewer farmers are expected to turn to the commercial poultry flock as a major farm enterprise. It is not likely that the financing plans will materially affect the level of egg production in this state." A later letter indicated that a few contracts with other companies had also been signed in Kansas.

<sup>14</sup> Evidences of this assumption are the efforts of many of the large chains to buy eggs directly from producers either by operating their own assembly plants or through contracts with assemblers who buy all eggs directly from producers. The tendency is to go to the areas where large quantities of the desired quality of eggs can be obtained. No area has a monopoly on this kind of procurement but it appears that there is a preference for obtaining these eggs near distribution points—if available quantities and prices permit.

at the farm level, candling can be eliminated and basically automatic equipment to remove blood spots and poor shelled eggs added which should ultimately reduce grading costs by one to two cents per dozen. Larger flocks will result in lowering procurement costs from one-fourth to one or more cents per dozen—depending upon present flock sizes. Ultimately, packaging costs will be reduced through the elimination of the need to use flats and fillers or filler-flats. Owners of very large flocks will carton eggs and move them directly to retailers. This will further reduce packaging costs because of fewer handlings of cases and therefore the same case can be used for more eggs. This will also lower transportation and facility costs.

*No area has monopoly on technical know-how*

One evidence of the application of technological advance is the rate of lay. Although there are average differences among regions, the rate has

TABLE 1. NUMBER OF EGGS LAID PER HEN AND PULLET OF LAYING AGE ON FARMS IN 1956 AND CHANGE FROM 1940-44 TO 1956\*

Region	Number of eggs per hen, 1956	Increase in number of eggs laid per hen from 1940-44 to 1956
North Atlantic	202	34
East North Central	199	52
West North Central	199	60
South Atlantic	190	64
South Central	172	52
Western	213	55
United States	196	55

\* *Chickens and Eggs, Farm Production, Disposition, Cash Receipts and Gross Income*, U. S. Department of Agriculture, July 1953 and April 1957.

been increasing in all areas. As may be seen in Table 1, the South Central states are lagging behind the rest of the country in rate of lay but the change since 1940-44 has been nearly as great as the average. Obviously this region has the greatest opportunity for improvement.

The South Atlantic group is also below the national average rate of lay but the increase has been greatest in this region. The greatest increase occurred in Georgia where in 1956 the average rate was 90 eggs per hen higher than in 1940-44. This increase was partly a result of low 1940-44 rate, 106 eggs per hen, but it is evident that no region has an inherent advantage over another in rate of lay. Areas which were slower in applying technological advances are likely to lower costs of producing commercial eggs more than those which adopted the necessary practices earlier.

*Effects of technological advances vary among areas*

Lowering of the feed input per dozen eggs should work to the advantage of the North Atlantic, South Atlantic, South Central and Western States since parts of these regions import feed for egg production. Shipping smaller quantities of feed to produce the same number of eggs will result in a savings in transportation costs for these areas. However, prices of laying mash now do not appear to be closely related to whether the area is surplus or deficit in feed.

There is some evidence of a tendency for eggs to be produced closer to consuming areas. From 1952 to 1955, reported shell eggs receipts at Atlanta from the South Atlantic region increased from 11.4 to 31.4 per

TABLE 2. PROPORTION OF REPORTED EGG RECEIPTS FROM REGIONS IN WHICH LOCATED, SELECTED CITIES, 1952 AND 1955\*

City	1952	1955
	per cent	per cent
Atlanta	11.4	31.4
Boston	81.1	86.1
New York	52.9	51.6
Philadelphia	63.0	72.3
Pittsburgh	5.2	7.7
Chicago	47.4	46.2
Cleveland	84.2	83.4
Detroit	85.3	82.3
San Francisco	80.5	75.0
Los Angeles	75.9	91.5

\* Data from *Dairy and Poultry Market Statistics*, Statistical Bulletin 135, October, 1953 and 173, April 1956, United States Department of Agriculture.

cent of the total (Table 2). Other cities in which shifts toward nearby areas took place were Boston, Philadelphia and Los Angeles. The reported receipts from the local region for New York, Chicago, Cleveland and Detroit were about the same proportions in each year. Relatively smaller receipts were reported from nearby areas for San Francisco. However, reported receipts fell from 1,018,507 cases in 1952 to 728,240 in 1955.<sup>15</sup> Reported market receipts are more likely to understate receipts from nearby areas than for more distant areas.

The West North Central region is the only major surplus producing area of the United States. Table 3 shows that the proportion of receipts from the Midwest area declined from 1952 to 1955 at Atlanta, Philadelphia and Los Angeles. The proportion of reported San Francisco receipts increased but the reported number of cases from the West North

<sup>15</sup> *Dairy and Poultry Market Statistics*, Statistical Bulletins 135 and 173, U.S. Department of Agriculture, October 1953 and April 1956, respectively.

TABLE 3. PROPORTION OF REPORTED EGG RECEIPTS FROM WEST NORTH CENTRAL STATES, SELECTED CITIES, 1952 AND 1955\*

City	1952	1955
	per cent	per cent
Atlanta	68.0	55.6
Boston	12.6	12.3
New York	41.1	43.0
Philadelphia	26.7	21.3
Pittsburgh	25.2	40.1
Chicago	52.7	53.7
Cleveland	12.6	12.3
Detroit	11.5	17.6
San Francisco	19.5	25.0
Los Angeles	23.5	8.4

\* Data from *Dairy and Poultry Market Statistics*, Statistical Bulletin 135, October, 1953 and 173, April 1956, United States Department of Agriculture.

Central States declined some 7 per cent. The proportion of reported receipts from the West North Central states at both Detroit and Pittsburgh increased from 1952 to 1955. At Detroit the increase was from Minnesota and at Pittsburgh from Minnesota and Iowa. The proportion of egg receipts from Iowa did not decline at Atlanta from 1952 to 1955.

#### *Proportion of eggs marketed by regions*

Data on numbers of eggs sold from farms are undoubtedly more accurate than those for market receipts. Data shown in Table 4 for 1940-44 to 1956 indicate a tendency to produce eggs nearer consumption centers, particularly on the two coasts. Massachusetts and New York were the only Northeastern states to decline in the proportion of total production. Of the South Atlantic states, Georgia, Florida, North Carolina and South Carolina more than doubled their proportion of production. Minnesota,

TABLE 4. PROPORTION OF U. S. FARM SALES OF EGGS, BY REGIONS SELECTED YEARS\*

Region	1940-44	1945-49	1950-54	1956
	per cent	per cent	per cent	per cent
New England	4.7	4.8	5.1	5.2
Middle Atlantic	12.1	12.3	14.1	14.4
East North Central	21.1	21.0	20.0	20.1
West North Central	29.3	30.5	28.4	27.5
South Atlantic	7.0	7.4	8.1	8.9
East South Central	5.4	5.3	5.0	5.0
West South Central	9.8	8.7	7.2	6.1
Mountain	3.3	2.9	2.8	2.5
Pacific	7.2	7.1	9.3	10.4

\* Data from appropriate issues of *Chickens and Eggs*, *Farm Production, Disposition and Cash Income*, United States Department of Agriculture.

Iowa, South Dakota, Indiana and Illinois among the North Central states increased their proportion of production. No South Central state increased its relative position. The only appreciable increase among the Western states was in California. In 1940-44, California ranked eighth among states in egg production. In 1956, only Iowa ranked ahead of California in total egg production.

### *Place Costs*

Most of the value of some technological or organizational changes accrue to nearby areas and others to distant points. The building of super-highways undoubtedly lowers the costs of moving eggs long distances.

One requirement of many retail programs of the future is likely to be daily store-door delivery of eggs. If such requirement becomes part of the quality-control program, nearby areas will obtain advantage over those farther from market. A nearby producer or distributor can ship 40 to 50 cases of eggs at about the same cost per dozen as for 400 to 500 cases. Distant shippers must rely on larger shipments to keep costs per dozen down. Store-door delivery costs for these shippers will be nearly as high after arriving in the market area as total transportation costs for the nearby shipper.

The transportation-cost advantage of the nearby shipper largely depends upon the method of transportation used by the distant shipper. For instance, costs from Midwest to Eastern points range from about 2 to 6 cents per dozen depending upon how the eggs are shipped. If one looks at averages, it appears to cost 3 to 4 cents per dozen to ship eggs from representative points in the Midwest to the East.<sup>17</sup> If published tariffs for common carriers are used this cost appears to be 3 to 6 cents per dozen.<sup>18</sup> If the eggs are shipped in a privately owned truck, transportation costs amount to about 2 cents per dozen.<sup>19</sup> Minimum nearby costs of delivery to either store-door or to other distributors are about one cent per dozen. Nearby points in either the Eastern, Western or Southern parts of the United States appear to have a minimum cost advantage of one cent over eggs from the heavy surplus regions. With store-door delivery and re-use of units for packing cartons, this advantage is likely to range from nearly 2 cents up to about 4 cents, depending upon location.

<sup>17</sup> W. H. Thompson, "Transportation Methods and Costs Involved in the Intra and Interregional Movement to Poultry and Poultry Products from the North Central Region." Preliminary Manuscript. North Central Regional Poultry Marketing Committee. 1957.

<sup>18</sup> G. G. Judge, *op. cit.*

<sup>19</sup> Robert M. Conologue, and Leo R. Gray. *Who Gets the Money for Eggs*. Agricultural Marketing 1:4:10-11. November, 1956.



*Estimated Quantities of Eggs, 1965*

Daly estimated per capital consumption of 380 eggs by 1960 and 403 by 1975.<sup>20</sup> These estimates were largely based on expected lower costs and therefore on increased supply. Recent estimates of the price elasticity of demand for eggs range from  $-.29$  to  $-.58$ .<sup>21</sup> Probably the trend is toward a lower price elasticity of demand for eggs. Eggs are basically a breakfast food. More eggs are eaten for breakfast when it is a family meal.<sup>22</sup> If the trend is toward fewer family breakfasts, as it appears to be, both the level and price elasticity of demand for eggs are likely to decline. As a result of this purely subjective evaluation of future demand for eggs, an estimated per capita utilization of 375 eggs for 1965 is used

TABLE 5. ESTIMATED UTILIZATION OF EGGS BY REGIONS, 1965 AND APPARENT SURPLUS OR DEFICIT IN 1965 AT 1956 LEVEL OF PRODUCTION\*

Region	Million cases of eggs needed in 1965**	Million cases deficit or surplus in 1965 at 1956 production
New England	11.5	-3.4
Middle Atlantic	36.9	-13.6
East North Central	39.4	-5.7
West North Central	16.4	+29.6
South Atlantic	28.6	-12.5
East South Central	13.7	-3.8
West South Central	18.7	-7.1
Mountain	7.3	-3.2
Pacific	24.1	-7.2
United States	196.5	-26.9

\* Population estimates from *Current Population Reports, Population Estimates*, Bureau of the Census, United States Department of Commerce, Series P-25, No. 110, February, 1955. Recently published population projections would change the estimates somewhat, but not the general picture.

\*\* At a per capita utilization of 375 eggs for each region.

in Table 5 for regional comparisons. This means a per capita consumption of approximately 355 eggs. If this estimate is low, it will not greatly affect the general regional picture.

The trends indicated by Table 4 imply that the New England, Middle Atlantic, South Atlantic and Pacific regions are likely to increase produc-

<sup>20</sup> Rex F. Daly, *The Long Run Demand for Farm Products*, Agricultural Economics Research 8:3:73-91, July, 1956.

<sup>21</sup> Richard J. Foote, *Price Elasticities of Demand for Non-durable Goods with Emphasis on Food*, AMS-96, United States Department of Agriculture, March, 1956.

<sup>22</sup> Ralph L. Baker, and A. S. Goldman, "Habits, Preferences and Demands of Des Moines Egg Consumers," *Poultry Science*, 30:3:329-339, 1951.

Horace Bruce Bylund, "Selected Social and Psychological Factors Associated with Levels of Egg Consumption," Unpublished Ph.D. Thesis, Pennsylvania State University Library, 1954.

Katherine H. Fisher, and H. Bruce Bylund, *A Child's Viewpoint on Breakfast*, Progress Report 171, Pennsylvania Agricultural Experiment Station, May 1957.

tion and offset much of the apparent deficit. If the apparent trend in the West North Central region toward lower relative production in all but Iowa, Minnesota and South Dakota continues, the surplus of this region is likely to be reduced.

Much of the same opportunities exist for increasing egg production in the Atlantic regions as existed in broiler production several years ago. In the South Atlantic region, the increased egg production in Georgia, North Carolina, Florida and South Carolina is evidence of a probable trend toward self sufficiency and even surplus production. Some of the increase in these areas is due to increased numbers of hatching eggs but market egg production is also increasing. The South Atlantic region and perhaps the North Atlantic region will probably follow the pattern already developing in California.

TABLE 6. CHANGES IN FARM EGG PRICES 1945-49 TO 1956, BY REGIONS\*

Region	Decline of regional average price 1945-49 to 1956	Change in regional price in relation to U. S. average price
	cents per dozen	cents per dozen**
North Atlantic	6.6	-2.7
East North Central	4.2	-0.3
West North Central	4.8	-0.9
South Atlantic	0.8	+3.1
South Central	0.7	+3.2
Western	8.0	-4.1
United States	3.9	—

\* Data from *Chickens and Eggs, Production, Disposition and Cash Income*, United States Department of Agriculture, June 1956 and April 1957.

\*\* — means price decreased relative to United States average price. + means price increased relative to United States average price.

As egg production becomes more and more a factory-type operation, egg price spreads among regions are likely to continue to decline (See Table 6 for 1945-49 to 1956 changes). Factory-type production will mean increased production of type A eggs. Prices for these eggs are not likely to be much higher than prices for the bulk of type B eggs. This will not discourage production of the former since total production and marketing costs are likely to be lower in relation to quality of eggs produced. In final analysis, no region of the United States appears to have an absolute economic advantage over any other in production costs for type A eggs. The biggest advantage is likely to be location close to point of consumption. A shift toward production of type A eggs may occur fairly rapidly. Institutional factors, such as willingness to embark upon new programs and ability to obtain financing for large-scale operations will go a long way toward determining the location of future egg production. However,

many producers on diversified farms are likely to continue producing eggs as long as returns cover out-of-pocket costs.

### DISCUSSION: COMMERCIAL EGG PRODUCTION REGIONS OF THE FUTURE

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Ralph Baker has done a commendable job in laying out the economic and technological factors that affect commercial egg production. He has used these factors to indicate the nature of egg production and marketing in the future and has listed the major changes in production that are likely to take place in the various regions of the country.

I agree with Baker on several of his major points.

First, we have not obtained the accurate information to say what the optimum limits are in terms of flock sizes.

Second, many institutional variables such as transportation arrangements present complications that are difficult to analyze in planning or programming optimum egg production areas.

Third, assuming no major change in technology or uses, eggs will continue to have a low price elasticity. As a specific example, to collaborate his point, data from the Michigan State University Consumer Panel showed that the per capita consumption of eggs in the first 22 weeks of both 1956 and 1957 was almost identical at 9½ dozen while the average price in 1957 was 7¢ a dozen lower than that paid in 1956.

Fourth, an analysis of egg prices and consumption rates cannot assume that eggs are homogenous but must recognize the significant differences that quality variations make.

There are a number of points, however, at which I would take issue with Baker's comments.

1. I question the arbitrary division of producers into two groups. The specifications of the A group appear to be quite variable, neither size of flock nor degree of specialization are mentioned as distinguishing characteristic between Group A and B. The proposal of selling eggs without a grade designation from Group A in competition with eggs of specific grades from Group B producers would only add to the confusion that the consumer presently experiences in making his quality choices.

2. I am not sure whether his statement "The biggest advantage is likely to be location close to point of consumption" refers to interregional production trends or to both inter and intraregional trends. If it is the latter, this statement would be an unsound generalization. Urbanization presents a limit of egg production close to the point of consumption.

3. Baker's statement "... it becomes obvious that much of the solution of the question of future location of commercial egg production must rest upon opinion rather than the precision of the mathematical model" sounds too fatalistic to me. An economic model cannot provide all of the answers. Yet opinion should be used advisedly. We want to be sure that we're referring to studied opinion and not curbstone opinion. This is not to cast reflections on the opinions of Baker or any of his correspondents expressed in his paper.

4. The tables showing proportions of egg receipts in terminal markets originating in various regions and the proportion of U. S. egg sales produced in different regions, have some geographic interest. However, actual changes in production are more pertinent to the purpose of his paper. The North Central states can be said to have held their own or increased some depending on the years compared. This gives quite a different notion than the indication of a decline in proportion of U. S. egg sales in that region. Furthermore, certain regions have decreased in proportion of eggs shipped into the larger cities. This again may cover up the facts that the cities have increased in population and therefore in eggs needed and that urban population in the production region itself has increased, making it logical for more of the eggs to be consumed nearby rather than shipped to distant markets.

5. Little reference is made to the relative income returns from the laying flock as compared with the income possibilities of other agricultural and urban industries. The opportunity cost created by these other enterprises and industries must certainly be reckoned with in considering future areas of egg production. The growth of egg and broiler industries in the South Atlantic states has frequently been said to be at least partly the result of underemployed labor created by various shifts in the cotton industry. This means that in looking for the expansion or contraction of egg production areas, attention must be given to changes in other industries, especially those affecting the alternate returns to labor in those areas.

6. As Baker has said "the biggest advantage is likely to be location close to point of consumption," we also need to note changes in population. The population increase in Florida, for example, has certainly contributed to the greater egg production in that state.

7. The inference that the Midwest will not be a potential area for increased egg production cannot be treated as a certainty. A change in government policy might release grain supplies in government storage or make it more profitable for the grain to be fed currently to poultry and other kinds of livestock rather than to be sealed under government loan. This would tend to give the Midwest an increased advantage in egg production from the point of view of feed cost.

8. Baker has said that "it may be necessary for more of the so-called vertically integrated types of production to come to the fore." This is a possibility but there are important reasons why integration in the egg industry may not develop to the extent and as rapidly as it has in the broiler industry. One of these reasons is that eggs have been more inelastic in demand than broilers and therefore a comparable increase in per capita egg consumption can hardly take place without extremely low prices. This aspect will be especially significant if these integrated programs involve new producers. On the other hand, this reason will be less important to the extent that these contract programs are with present commercial egg producers.

9. Baker has probably had the cost advantage of bulk feeding in mind; however, it should be pointed out as a significant factor in reducing feed costs especially in areas of concentrated production.

10. Although nearby production areas have a transportation advantage of one to four cents a dozen over surplus production areas, the transportation cost of assembling eggs from producers in a nearby area where production is not as concentrated as in an area of concentrated surplus production, can cancel a substantial part of the transportation advantage of being close to the consumption center.

11. Reference is made to frozen and dried egg solids. These phases of the industry have moved relatively slowly since World War II but, with the current interest in food technology, processed eggs will increasingly become more important. Egg processing will be expected to expand in areas of concentrated surplus production. A corollary of the increase in processed eggs will probably be a reduction in the number of eggs consumed per capita in shell form.

In summary, the recommendations that agricultural economists can make in directing egg production as well as other agricultural enterprises so as to afford the soundest rationing of the scarce factors of production are one of the most sought after services of the profession. To develop these recommendations we can evaluate the factors that apparently will contribute to future egg production regions as Baker has done. We must also go further and tackle some of the unsolved problems that are faced in a dynamic industry.

1. How can we determine the place for cage layer systems?
2. Can the raising of pullets to laying age become a specialized operation separate from the egg laying operation itself?
3. What are the capital and entrepreneurial rationing problems associated with vertical integration?
4. Can we develop more elaborate models that will go beyond static assumptions and recognize the dynamic circumstances?



# IMPROVING RESEARCH IN AGRICULTURAL ECONOMICS

Chairman: G. H. Aull, Clemson College

## METHODOLOGY FOR STUDYING DECISION MAKING\*

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IN VIEW of my experience with the Interstate Managerial Survey, hereafter referred to as IMS, any discussion on my part of the methodology for studying decision making is related to that study. The development of decision making as a field of study is far from uniform and the different subfields are in various stages. Appropriate methodologies and methodological issues depend on the theories and concepts that guide the researcher. In numerous subfields of decision making, theory is still embryonic. In these subfields, methodological, taxonomical and conceptual issues need to be discussed jointly with conceptual considerations predominating. Until conceptual issues are partially settled, case studies and elementary description are likely to be more important than highly developed instruments and analytical procedures.<sup>1</sup>

### *The Problem of Defining Managerial Problems*

Managerial problems involve beliefs and values or, stated alternatively, concepts of "what is" and "what ought to be." The problems that managers handle probably grow out of conflicting ideas about "what is," conflicting ideas about "what ought to be," and differences between ideas about "what ought to be" and accurate ideas about "what is."

Although Boulding's recent book entitled, *The Image*, appeared after the IMS was designed, there is a general correspondence between the concepts presented in that book and those used in formulating the IMS. Boulding conceives that the managers of the individual behavioral units of an economy, such as households, or firms, construct mental images of the situation in which they operate. These images involve both concepts of

\* Michigan Agricultural Experiment Station Journal No. 2122. The author is indebted to the following persons for helpful criticisms and comments: Dale Hathaway, Earl Partenheimer, Peter Hildebrand, James Nielson and Wesley Sundquist.

<sup>1</sup> In what follows, it will be assumed in the interests of brevity that my audience is familiar with earlier work systematically reported in the managerial concepts presented in Kentucky Bulletins 593 and 619 N. Dakota Bulletin 400; Bradford's and Johnson's *Farm Management Analysis*, Heady's *Economics of Agricultural Production and Resource Use*, Heady's and Jensen's *Farm Management Economics*, Kenneth Boulding's, *The Image*, and the background papers presented at the East Lansing meeting of the American Farm Economic Association. See *Journal of Farm Economics*, December 1955, pp. 1097-1125.

"what is" and of "what ought to be." There is, according to Boulding's ideas, a value system superimposed upon the behavioral unit's image of the real world. In Boulding's formulation, a managerial problem involves moving from the less valued portions of the real world to those which the behavioral unit values more highly. Though Boulding's formulation of the managerial process is far superior to, it is not inconsistent with, IMS formulations and conclusions.

Neither the IMS nor Boulding's<sup>2</sup> work have dealt with the vexing methodological problem of how to study value formation empirically. The methods of science are obviously effective in settling questions about "what is" and are of considerable help in making "what is" conform with "what ought to be." However, they are certainly less productive, if not downright inappropriate, in solving problems involving (1) conflicting ideas about "what ought to be" or (2) the necessity of changing concepts about "what ought to be" to conform with "what is." Thus, managerial theories that treat managers as scientific problem solvers are likely to encounter operational difficulties. On the other hand, managerial theories that regard managers as capable of solving problems by other methods encounter major epistemological issues in the field of philosophy.

#### *Types and Sources of Information Used by Farmers*

Prior to the IMS, farm management workers had deduced that five types of information<sup>3</sup> are essential in organizing a farm. The questions in the IMS concerning types of information used by farmers were non-structured in the sense that these *a priori* information classes were not used in presenting the questions to respondents.

Answers were coded according to over two hundred empirical information categories. These were, in turn, grouped into forty-two broader categories which can, in turn, be grouped into seven still broader categories. These seven *empirical* categories include the five *a priori* categories; price, existing technology, new technology, institutional and human. The two additional categories are home technology and information on how to perform various managerial processes. The sixth category, home technology is, of course, a subdivision of one of the five *a priori* categories

<sup>2</sup> Boulding observes, "and although I shall argue that the process by which we obtain an image of values is not very different from the process whereby we obtain an image of fact, there is clearly a difference between them."

<sup>3</sup> Early in the formulation of IMS its designers were confused about types of information and problems. Farms were envisioned as having price, production, human and institutional problems. The word "problem" and the phrase "type of information" were used interchangeably. Later, it became clear that problems are complex things whose solutions ordinarily require more than one type of information. While subsequent workers should not be expected to become involved in such simple confusion, it is worthwhile noting this difficulty to assure it is avoided in the future.

while the seventh is not, of course, a purely information category. Thus, the original *a priori* classification stands the pragmatic test of proving useful.

It is apparent, however, that each of the five *a priori* categories could be subdivided into two parts, one dealing with production and the other with consumption. Further, our experience indicates that the distinction in the original classification between existing and new technology could, in some instances, be carried out advantageously for price, institutional and human information. This suggests that future researchers working on the management of farms might well employ sixteen information categories consisting of price, technological, institutional and human information, each subdivided into two parts, one dealing with productivity, the other with consumption with the resultant eight categories, in turn, each being subdivided into two parts, one dealing with the existing situation and the other dealing with prospective changes in the existing situation.

*Sources of information used by farmers.* In the IMS, farmers were queried about twenty-three different sources of information used in securing the five *a priori* types of information discussed above. The questions used were structured and, of course, failed to benefit from what was learned during the study about the types of information used by farmers.

Of the twenty-three sources of information investigated, six were noncommunicative and seventeen were communicative. The noncommunicative sources of information are those which can be used without contacting another person verbally or in writing. The communicative sources all require the use of the written or spoken word.

For all of the five *a priori* types of information, the two most used sources of information included both a communicative and noncommunicative source.

The IMS experience then suggests strongly that noncommunicative sources of information are highly important and that research designs and methodologies should be adapted to study how to improve the use made of these sources. This conclusion, of course, runs counter (1) to the current emphasis of the agricultural colleges on the communication problem and (2) to the tendency of sociologists to emphasize the written and spoken word in the diffusion process to the exclusion of noncommunicative sources of information.

### *Expectation Models*

Among the first agricultural economists becoming interested in dynamic theory were T. W. Schultz and some of his disciples at Ames. They concentrated on the formulation of price forecasts or expectations of

prices. These men were familiar with statistical methods and tended to assume that farmers use statistical models to forecast prices.<sup>4</sup>

In addition to an interest in price expectations, the designers of the IMS were concerned with how farmers acquired information on new technology, institutions and people. Preliminary questions considered in IMS involved *statistical* expectation models for three additional types of information<sup>5</sup> parallel to those developed for prices by Schultz, Gainer, Heady, Kehrberg and Jebe.

Pretesting indicated that farmers expectation models are not primarily statistical in nature. Consequently many preconceptions were dropped and the questions reformulated along open-ended, probing lines to find out what types of models were actually in use by farmers.

*Price expectation models.* In the case of price expectation models, the procedure finally adopted was to have the farmer indicate a commodity he purchases and another he sells and then investigate the procedures followed in formulating the forecasts.

Farmers display a surprising knowledge of economic concepts and facts.<sup>6</sup> The highly statistical price models considered earlier in Ames do not, in fact, play dominant roles among farmers. Statisticians, however, will be highly pleased to learn that many of the farmer's price models were integrated with factual information.<sup>7</sup>

*Expectation models for technological change.* Here again, openended probing questions were used, first, to find out whether or not the respondents expected changes in farming methods and then to determine their reasons for expecting these changes. Farmers, as well as academicians, appear to use few concepts in forecasting technological change. Their models for predicting technological change were less theoretical than

<sup>4</sup> More recently Heady assembled various statistical price expectation models and published them in his *Economics of Agricultural Production and Resource Use*. Still more recently Heady, Kehrberg and Jebe investigated the accuracy of these various statistical models. See Earl O. Heady, Earl W. Kehrberg and Emil H. Jebe, *Economics Instability and Choices Involving Income and Risk in Primary Crop Production*, Agr. Exp. Sta., Iowa State College, Research Bulletin 404, January 1954.

<sup>5</sup> As new technology consists of changes in existing production methods, the problem of formulating expectation models for production methods is the same as that of formulating expectation models for new technology.

<sup>6</sup> Among the 532 farmers questioned, 335 farmers used models involving supply, demand, or supply and demand concepts. Commodity models used included quality considerations, trends, seasonality and futures. More general models included what have been termed "government action models"; inflation-deflation, level of employment and business activity models; war models and political models.

<sup>7</sup> In coding these data, fairly well-trained mathematicians and statisticians were asked to indicate how many of the models they thought were complete enough (in the econometric sense of being "just identified") to yield a single, unique price forecast. Among the 532 schedules coded, our coders indicated that 80 displayed such complete models.

those for predicting price changes tending instead to be more empirical and statistical in nature.

*Institutional expectation models.* The openended probing-type questions used in this instance involved changes in federal, state and local government programs and policies. By and large, the models farmers appear to use in forecasting such changes are not as empirical and statistical in nature as those used to forecast technological changes. The theories and concepts used, however, appear to be more primitive and naive than those used in forecasting prices.

*Expectation models for human behavior.* Open-ended, rather formal probing procedures were used. If the farmers indicated that they could evaluate strangers on first contact, they were asked on what basis. Those who evaluate strangers on first contact tend to evaluate on the basis of attitudes, actions, intuitive feelings and other more objective evidence. Among the attitudes used in evaluating people on first contact were: people are to be trusted, strangers are not to be trusted and strangers are accepted as good until they indicate this is not so. Evidence used for evaluating persons on first contact includes such symbols as general appearance and looks; dress and clothing; means of transportation; brief cases, clip boards and measuring instruments; facial expressions; physical condition of hands; style of speech; skill in speech; stereotypes involving occupation, drinking and race; quality of speech; content of speech; method of approach; disposition and other symbols too numerous to mention here. Among those farmers indicating that they do not evaluate strangers on first approach, a number indicated that they adopt a wait and see approach; some such persons evaluate on the basis of performance while others evaluate, among others things, on the basis of information secured from other people.

### *Analysis and Interpretation of Information*

Thus far, we have dealt mainly with the process by which managers and other behavioral units acquire information. We are now ready to consider the analysis and interpretation of information by managers.

*The use of induction and deduction.* The discussion of expectation models and noncommunicative sources of information indicates that the analytical and interpretive processes of farmers are deductive as well as inductive.<sup>8</sup> The answers to the IMS questions which investigated this subject more specifically show that most farmers use both induction and deduction and that many feel it is impossible to use one without using

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<sup>8</sup> The terms induction and deduction are used in their usual philosophic sense, both here and elsewhere in this paper.



the other. Other IMS data indicated that farmers use both methods of thinking with some slight preference for induction.

*Marginal and average analysis in planning hog production and machinery investments.* The ability of farmers to understand marginal analysis as contrasted to reasoning from totals and averages was also investigated. The answers, which were analyzed in detail by Greve,<sup>9</sup> indicate a considerable ability on the part of farmers to understand the usefulness and limitations of the marginal and average examples.<sup>10</sup>

Of the 356 farmers interviewed, 62 indicated that they tended to use marginal analysis whereas 46 indicated that they use average analysis while 181 stated they use other methods not involving an understanding of marginal analysis. Other methods of figuring out how many litters of pigs to produce involved limitations on the production organization of a farm. Among these limitations were feed supply, real estate limitations, labor limitations, operating capital limitations and land-use patterns. These methods are very similar to those used by traditional farm management personnel and imply that current developments in the theory of fixed assets should be considered in developing further research on decisions involving farm organization and operations.<sup>11</sup> It also suggests the need to extend linear programming techniques to handle the questions of what is, in fact, fixed instead of making rather blind assumptions about asset fixity.

*Other investigation of how farmers "make up their minds."* In the IMS, four openended questions dealt with how farmers made up their mind in actual situations about (1) how much of each product to produce, (2) how much of an input to use in producing a product when the price of the input changes, (3) what to do about the production of a product as a result of a change in its price, and (4) buying a major piece of farm machinery.

The answer to the question about how farmers make up their mind about how much of each product to produce indicated that only 26 of the 172 farmers queried actually adjusted production to price changes and price expectations while another 13 adjusted to income and debt repayment requirements. Most of the remaining 133 farmers considered limi-

<sup>9</sup> Robert W. Greve, *Use and Interrelation of Marginal Analysis and other Analytical Processes by Farmers in Decision Making*, Unpublished M. S. Thesis, Dept. of Economics and Sociology, Kansas State College, 1957.

<sup>10</sup> Of the same 356 queried farmers, 184 indicated correctly that they could not figure out from an example involving averages how many litters of pigs it would be profitable to produce. Another 63 indicated that they did not know how many was correct in this example, while 102 indicated incorrectly that they could figure out the most profitable numbers of litters to keep. On the other hand, 47 out of 356 indicated correctly the most profitable number of litters of pigs to produce from an example involving marginal analysis.

<sup>11</sup> Glenn L. Johnson and Lowell S. Hardin, *Economics of Forage Evaluation*, Purdue University, Agricultural Experiment Station, 1955, pp. 6-12.

tations on production; here again, the importance of fixed asset theory to the discipline of farm management is indicated.<sup>12</sup>

The two questions dealing with actual price changes revealed that production adjustments occurred in a relatively small proportion of the cases. The discussions of why no adjustments were made were consistent with hypotheses involving compensating price adjustments, expectations of opposite forthcoming price changes, product-product complementarity, input-input complementarity and fixed conditions within the business.

Still another question in the study investigated the process by which 362 farmers decided to buy the last major piece of machinery they had purchased. These farmers were interviewed in depth with the answers being recorded in considerable detail. The answers were coded for their content with respect to the five managerial tasks. In general, results for this question, agree with the pattern of conclusions now emerging from the rest of the questionnaire.

### *Degrees of Knowledge*

When Frank Knight wrote his ground breaking *Risk Uncertainty and Profit* on dynamic economics, he defined risk, uncertainty and certainty as three situations in which a manager might find himself when making a decision insofar as knowledge of a future event is concerned.

With Cecil Haver and Lawrence Bradford, I have presented a five-fold classification of degrees of knowledge held by farmers which is based on Abraham Wald's sequential analysis. The five degrees of knowledge we have defined are risk action, forced action, inaction, learning and certainty.<sup>13</sup>

IMS results indicate that these five degrees of knowledge, while clearly relevant, are still inadequate. A high proportion of the farmers were able to understand and give verified examples of situations in which they had encountered these varying degrees of knowledge. However, close examination of the answers indicated that the classification is valuable mainly in understanding decisions at the time decisions are being made. Ex post, it appears difficult for farmers to distinguish among the various negative decisions. For instance, it is difficult for a farmer to tell after a decision whether he decided not to act because circumstances forced him not to act or because he decided on a risk action basis that he was willing to refuse to act and take the consequences of being wrong. It was also

<sup>12</sup> Seventy-seven of the 172 queried tended to use a land-use approach to farm organization, while 19 used a livestock approach; six, an income or debt-repayment-need approach; eight, a price expectation approach; and only two a labor-use approach.

<sup>13</sup> These five degrees of knowledge are defined rather rigorously in *Proceeding of Research Conference on Risk and Uncertainty in Agriculture*, North Dakota Agricultural Experiment Station Bulletin 400, 1955, pp. 64f.

difficult to distinguish, *ex poste*, between negative forced actions and plain inactions.

Although classification of degree of knowledge on which this portion of the IMS is based is inadequate, it is also apparent that Wald's contribution prevents researchers from returning to Knight's risk, uncertainty and certainty classification. Instead, it appears that the classification used in IMS should be developed further before more empirical work is done on the degrees of knowledge held by farmers.

### Action

Of the five managerial tasks, observations, analysis, decision making, action taking, and responsibility bearing, the action taking and responsibility bearing tasks are the most poorly formulated in the IMS.

The action task involves placing decisions into effect. Examination of the literature on executing decisions makes it clear that a body of integrated theory involving the execution of decisions is unavailable. Instead, we have mainly rules of thumb experienced executives have found useful in managing their domains.

The primary methodological need with respect to research on the action or executive function appears to be conceptual. This suggests the need for case and pilot studies, on the empirical side, and speculative inquiry on the abstract side with the end in mind of creating a conceptual framework to use in studying the executive or action function.

One aspect of the study which deals with action and which is interesting from a methodological standpoint involves the use of personal strategies. In operating their businesses, farmers use personal strategies bordering on the unethical. This makes it difficult to secure information on the extent to which such strategies are actually employed.

After designing, pretesting and redesigning many questions, three *projective* type questions were designed involving the kinds of strategies employed by farmers in making machinery deals. Currently, oblique questions of this type, as contrasted to direct interviewing techniques are in vogue because of their value in out-manuevering respondents who are consciously or unconsciously reluctant, evasive and/or dishonest. Most such techniques involve inferring some value for a variable Y from an observed value for a variable X. Y is observed because reluctance, evasiveness and dishonesty make it difficult to observe Y. Often times the relationship between Y and X has not been and cannot be established empirically because (1) Y is unobservable or (2) X is hypothetical. Unless other work has established empirically the relationship between X and Y, these difficulties with oblique questioning techniques suggest caution in substituting them for direct techniques.

In formulating questions concerning impersonal strategies employed by managers, divergencies arose. Some committee members felt that attitudes could be inferred only from behavior; others felt that attitudes could be inferred only from statements of attitudes. At any rate some of the questions turned out to be attitudinal while others became behavioristic. When the results were analyzed using Gutman scaling techniques, the behavioristic questions failed "to fit" the attitudinal scales involving insurance. Ex poste, it is obvious that attitude towards insurance is not necessarily reflected in action. As Nybroten has pointed out, it may be as dangerous to infer attitude from observed behavior as behavior from expressed attitude.<sup>14</sup> In any event, our experience indicates that the two approaches should not be mixed.

### *Responsibility Bearing*

The important task of responsibility bearing has not been studied adequately. The questions in the IMS specifically orientated towards responsibility bearing had to do with farmers willingness to take risks to secure gains and to insure to avoid losses. These questions based upon the Fried-Savage utility hypothesis provided a basis for estimating the utility of wealth.<sup>15</sup> Such utility estimates indicated that a relatively high portion of the farmers interviewed were responsible individuals in the sense that they were willing to take risks at unfair odds to achieve *important* gains and willing to buy insurance, also at unfair odds, to avoid *important* losses. Only a small fraction of the utility functions estimated indicated that farm managers were irresponsible gamblers pathologically seeking unearned gains at long odds or equally pathological milquetoasts willing to pay unfair odds to avoid trivial risk.

Although the utility of wealth can be conceived as a least common denominator for many values, it is at best a very unsatisfactory way of aggregating security, freedom, justice, individuality, etc. This suggests a very real need to clarify our understanding of value formation and interrelationships as a basis for understanding the responsibility function. Thus, the stress placed on the need to understand values in connection with the "problem of problems" is reinforced by a need to understand values in connection with responsibility bearing. But this is not the end of the matter; responsibility bearing influences the acceptability of decision

<sup>14</sup> Norman Nybroten, "Methods of Studying Attitudes Relevant to the Economics of Fertilizer Marketing," *Economics and Technical Analysis of Fertilizer Innovations and Resource Use*, E. L. Baum, et al., Editors (The Iowa State College Press, Ames, Iowa), 1957.

<sup>15</sup> Albert N. Halter, *Measuring Utility of Wealth Among Farmers*, Unpublished Ph.D. Dissertation, Department of Agricultural Economics, Michigan State University, 1956.

specifications which in turn influence the amounts of observation and analysis required. Clearly, the study of values is a neglected fundamental aspect of the study of decision making.

It seems worthwhile to say something further about estimating the marginal utility of wealth. Albert Halter has completed a detailed analysis of the utility of wealth among the farmers surveyed. His work indicates that it is possible to construct utility estimates for wealth, which are cardinal but nonetheless relative and applicable only to the person for whom they are made.<sup>16</sup> While these utility estimates are not interpersonally comparable, Halter's work indicates that people can be classified on the basis of characteristics of their utility functions and that these classifications are useful in predicting behavior.

This suggests that similar utility estimates may prove to be valuable indicators of the willingness of people to buy insurance and other services or goods. At MSU we are, in fact, attempting to use such estimates to determine the value different kinds of consumers place on different qualities and sizes of eggs and apples. While it is too early to evaluate this research yet, it is safe to say that the instruments used in this work show some promise.

#### *Some Brief Comments About Some Current Approaches to the Study of Management*

There are a number of current approaches to the study of management which can be commented on profitably.

*The Harvard case study approach to business administration.* In teaching business management, the School of Business Administration and Public Service at Harvard University has recognized that no single body of managerial theory and principles exist. Instead, management has been taught by a case study approach. This case study approach has involved the solution of business problems using information and systems of analysis from any source available and of any type appearing relevant to the solution of the problem. The method of teaching is effective. The success of this method of teaching as contrasted to methods that specialize in some discipline such as economics does not necessarily indicate that the case study method is as far as we can or should go in developing management. Perhaps, we can go on to theory construction, empirical work, analysis and synthesis.

*Some comments about Bohlen's and Beal's work on how farm prac-*

<sup>16</sup> They are relative in that an estimate for, say, the ten thousandth dollar gained is measured in terms of the utility to the individual involved of the last dollar of his present income.



*tices spread.*<sup>17</sup> The interesting work on the diffusion process summarized and dramatized by Bohlen and Beal has been considered in tabulating and analyzing IMS data. The limited results summarized by the two workers appear to be in close agreement with corresponding portions of the IMS data. However, it must be stressed that the sociological point of view with respect to decision making neglects very seriously the degree to which farmers use statistical procedures, economic principles and the technical disciplines in solving problems involving new practices.

*Mathematical and statistical approaches.* At the 1957 meeting of personnel cooperating with the Tennessee Valley Authority on the economics of fertilizer use, Richard King from North Carolina presented some promising hypotheses concerning the decision making process.<sup>18</sup> These hypotheses, which were largely mathematical and statistical in nature and were formulated in terms of set theory, appear to have considerable promise. However, some workers on the IMS were impressed that the King hypotheses failed (1) to consider the process by which farmers acquire and analyze information in making decisions or (2) to define problems in relation to value formulation. King's approach is rather typical of the specialized approach of mathematicians and statisticians to the study of decision making. Most such approaches concentrate on a small portion of the decision making process, often exploring it with great rigor and thoroughness. Although this has the obvious advantage of specialization, it entails the usual costs of specialization including the lost ability of the specialist to envision the entire field of endeavor well enough to select and to work on its most relevant and important parts.

#### *General Impressions About Managerial Thought and Methodology*

It is becoming increasingly clear that most of the academic disciplines can contribute information and deductive systems to the study of decision making. However, to decision makers the academic disciplines are primarily subject-matter orientated. As such they deal with the kinds of information managers use in solving problems. A few of the disciplines such as logic and statistics deal with parts of the process by which managers solve problems. None of the disciplines appear complete enough to encompass all of the managerial process. It is also clear that economics plays a relatively minor role in the study of management.

It also seems clear that values (concepts of what ought to be) are also

<sup>17</sup> George M. Beal and Joe M. Bohlen, *The Diffusion Process*, Special Report No. 8, Agricultural Extension Service, Iowa State College, March 1957.

<sup>18</sup> R. A. King, *The Study of Farmer Decision Making Processes*, Mimeograph remarks at the annual conference for cooperators in TVA Agricultural Economic research activities, March 27, 1957, Knoxville, Tenn.

important in management and that management appears simultaneously to be both a science and a humanity.<sup>19</sup>

Generally speaking, when economists turn to the study of management, they tend to turn first to statistics and then to logic and, contrarywise, that when sociologists and psychologists turn to the study of management they tend to ignore statistical and marginal analysis. There also appears to be a corresponding tendency of mathematicians and statisticians to ignore other disciplines, particularly the humanities.

Various specialized approaches to management followed by statisticians, mathematicians, sociologists and psychologists are all likely to be fruitful contributors to the general formulation of managerial thought. However, no one of them is likely to be complete enough to make more than a partial contribution.

At the present time, unsettled conceptual problems preclude final decisions on "instruments" of measurement and methods of analysis. However, as these concepts are in such an unsettled state of affairs, some reasons exist for rather extensive use of case studies and elementary description in attempting to gain conceptual insights.

<sup>19</sup> Your speaker is aware that some philosophers feel that systematic knowledge cannot be acquired by methods other than those subsumed under the term science. However, he finds a certain amount of comfort in the number of philosophers who also feel that systematic knowledge (especially in the field of values) can be acquired by other methods. This, of course, is not to say that values are not an integral part of science.

## DISCUSSION: METHODOLOGY FOR STUDYING DECISION MAKING

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At this terminal point in the IMS (Interstate Managerial Study) it is appropriate that our profession receive a report of progress. We are grateful to Professor Johnson for preparing and presenting this report to us. Some of us may have expected more discussion of methodology than is contained in his paper. For example, we may have expected a full and explicit development of the methodological implications of the study for future research. I will aim my discussion toward some methodological conclusions and point out what I believe to be some weaknesses in the conceptual structure and methodology of the IMS that Professor Johnson did not recognize in his paper. In particular, I wish to question the conclusions of his paper pertaining to deductive and inductive thinking of farmers.

Johnson recognized some limitations of the original conceptions for the study as inadequate attention to values, but he has not recognized the possibility that this underemphasis on values also may include his conception of the thought processes of farmers in decision making.

In his paper, Johnson seemed to be inferring type of thought processes from types and sources of information farmers indicated to be significant in their decisions. If this interpretation is correct, I wish to challenge the thinking of the leaders of the IMS with these questions: Is there a *necessary*, logical relationship between types or sources of information farmers say are important for their decisions and types of mental activity preceding their decisions and actions? If yes, why?

The types of questions asked in the survey relating directly or indirectly to types of thought processes presupposed the following: (1) farmers know how their reasoning operated in problem situations; or, (2) if they did not know the nature of their thought processes, the responses will demonstrate this lack of knowledge; and (3) actual reasoning invited by open ended questions was the same in nature and content as that which took place, or will take place preceding action.

Do people really know what goes on in their minds when they are faced with a decision to make? Frank Knight, in his *Risk, Uncertainty and Profit*, made the following statement:<sup>1</sup>

... "So when we try to decide what to expect in a certain situation, and how to behave ourselves accordingly, we are likely to do a lot of irrelevant mental rambling, and the first thing we know we find that we have made up our minds, that our course of action is settled. There seems to be very little meaning in what has gone on in our minds, and certainly little kinship with the formal processes of logic which the scientist uses in an investigation . . ."

We find variations of this idea expressed in other literature.<sup>2</sup> According to Dewey, when people do think, the complete act necessarily involves both inductive and deductive thought processes, and these two processes are interdependent phases of the same operation.<sup>3</sup>

If farmers do not know the nature of their thought processes, will they respond in such a way to direct questions that this lack of knowledge can be demonstrated? A natural inclination of people is to avoid expressing their ignorance. The questions in the IMS schedule did give the respondents an opportunity to choose answers that demonstrated knowledge instead of ignorance, and we could expect many such responses to be

<sup>1</sup> London School of Economics and Political Science, No. 16 in series of Reprints of Scarce Tracts in Economic and Political Science, p. 211.

<sup>2</sup> Cf. Newcomb, *Social Psychology*, Linton, *The Cultural Background of Personality*, Simon, *Administrative Behavior*, and Dewey, *How We Think*.

<sup>3</sup> Cf. F. L. Whitney, *The Elements of Research*, pp. 1-9, and John Dewey, *Logic, The Theory of Inquiry*, pp. 419-441.

internally consistent. It is difficult, if not impossible, to isolate and measure the bias in these kinds of responses.

My major concern with Johnson's conclusions on deductive and inductive thinking relates to this question: Is the reasoning exhibited in the responses to openended, probing questions the same in nature and content as that which took place, or will take place, preceding farmer actions?

Myrdal states that people have two types of ideas:<sup>4</sup> (1) ideas about how reality actually is, or was, and (2) ideas about how it ought to be, or have been. The former, called beliefs, and the latter, called valuations, correlate with Boulding's distinction in *The Image*. Expressions of opinion or of reasons for actions involve an interdependent relationship between valuations and beliefs. People want to be consistent in their reasoning brought forth as motives for specific action. Such expressions, according to Myrdal, are the "good" reasons rather than the "true" reasons for particular decisions and actions; in short, they are "rationalizations." Rationalizations serve the function of bridging conflicting valuations, and these are selected in relation to the expediencies of the occasion. Rationalizations indicate very inadequately behavior than can be expected, or the true reasons or reasoning underlying actual behavior.

In accordance with these ideas, I would expect considerable rationalization by farmers when interviewed about the way they make decisions and reasons for decisions made. I do not believe these rationalizations necessarily bear any relation to the actual thought process preceding a past decision, or the thought process that will occur in a future problem situation. A farmer can rationalize a past decision that he made without thought, and he may offer a different explanation of his past actions than the actual reasoning and motives relevant at that time. It is possible, also, that, because rationalizations are incomplete acts of thinking and could be expected to be deductive in character, inferences on the thought processes of farmers derived from responses to openended, probing questions could be biased in favor of deduction.

Now, it is possible that the ideas I have assembled from social science literature are false and the conceptions guiding the IMS are true. However, the IMS was not designed to generate data to permit a choice from the entire range of theoretically possible conceptions of the decision making process. Herein lies a major methodological problem in future studies of management. Churchman expressed or implied the ideas that every hypothesis in research should be a consequence of a formal theory or conception of nature, the set of hypotheses in a research undertaking should exhaust the theoretical possibilities, the hypotheses must be logi-

<sup>4</sup> Gunner Myrdal, *An American Dilemma*, pp. 1027 ff.

cally inconsistent, and the data generated in the study should permit a choice to be made from among the alternative hypotheses.<sup>5</sup> Meeting these specifications in research on management is a difficult undertaking (1) because of the conceptual problem of deriving an adequate set of hypotheses, and (2) because of the technique problem in designing an investigation that will generate the needed data to test the hypotheses.

On the surface, the technique problem appears to be the more formidable but I believe many of our technique difficulties will disappear as progress is made at the conceptual level. Our conceptual problem does not end with the assembling of ideas that exhaust the theoretical possibilities for the decision making process. We must deduce consequences within the various conceptions that can be objectively judged to be true or false on the basis of observable facts.

I wish to urge continuation of the research on decision making under the leadership of Johnson. However, I believe human values should be included among the conceptions used in the research on the thought process of farmers.

<sup>5</sup> C. West Churchman, *Theory of Experimental Inference*, Chs. 10-12.



## INTEGRATION OF THE SCIENCES FOR EFFECTIVE RESEARCH\*

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THE objective of improving research in agricultural economics or in any other discipline is to increase the efficiency of that discipline in problem solving. A more overriding objective in publicly supported institutions is increasing their contribution to the utilitarian goals laid down in the land grant charter of 1862.<sup>1</sup> Attainment of these goals has become increasingly difficult and elusive. Land grant colleges have been and are substantial contributors to a continually changing economic and social environment in and out of agriculture. These contributions in turn have resulted in continual generation of new problems.

### *Historical Setting*

The land grant college movement had as its central force, and is part of, the movement of extending free education to the masses.<sup>2</sup> The evolving democratic political structure and rapid industrialization of the last century supported an adaptation of educational institutions on the premise "if knowledge is power over resources, why not more power."<sup>3</sup> Contributions of educational institutions and of research to increasing power over resources came to be generally recognized, although materialism became the final test of the usefulness of a technique or the worth of an institution.

One of the major initial aspects of the adaptations of higher education to the demand for utilitarianism was curriculum reform. The desire for a "practical" education meant knowledge applied to practical problems. But applied knowledge and curricular reform awaited developments of an agricultural research program. Not until research and scientific methods had been applied to "practical" problems could a background of informa-

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\* Contribution from the Missouri Agricultural Experiment Station, Journal Series No. 1790. Approved by the Director. The author is indebted to Professors J. Wendell McKinsey, V. James Rhodes, and O. R. Johnson for helpful criticism. Acknowledgement is due to members of the meats research team, particularly Professors D. E. Brady and Margaret Mangel and to Dean J. H. Longwell who stimulated further study of problems in research integration.

<sup>1</sup> Integration here is limited to those disciplines commonly found in colleges of agriculture inasmuch as the tradition of research in the liberal arts colleges has not developed strongly embedded utilitarian goals of research as in agriculture.

<sup>2</sup> E. D. Eddy, Jr., *Colleges for our Land and Time* (New York: Harper and Brothers, 1957, Ch. 3.

<sup>3</sup> E. D. Ross, "The Land-Grant College: A Democratic Adaptation" *Agricultural History*, XV (January 1941), p. 27.

tion be accumulated to satisfy the needs either in the curriculum or in solution of problems.<sup>4</sup>

Initially all subject matter was under the comprehensive title of "Agriculture."<sup>5</sup> Special interests began clamoring for instruction in their special fields of activity. At most institutions the very first group to demand specialized research and instruction and a full-time professor were the horticulturists. Subsequently other specialized interests were instrumental in encouraging further research departmentalization particularly in the two decades after 1890. The basic sciences thus were fragmented into specializations largely on commodity lines. The pattern of departmentalization became fairly standardized in most colleges. Each applied "science" developed supporting national professional organizations which have occasionally behaved as pressure groups and have deterred needed evolution in the organization for research.

As the departmentalization of research grew, so did a body of specialized applied knowledge developed for use in the classroom and for application on farms. The application of the varied basic sciences in each of the departmental fields became more sophisticated and contributed materially to increasing acceptance of the colleges by 1910.

A maturity of the college of agriculture began to express itself after 1925 in various ways. By this time the agricultural student became accepted as equal in academic endeavor to students in other schools. The agricultural staff member began generally to be recognized as a scholar by other university faculty members. Thus having attained status on campus and acceptance by farm people there appears an illusion of finality and success. Since that time there has been no really important change in organization as a means of adapting colleges to the needs of those they serve.

### *Present Setting*

Technological forces relating to agricultural production and general progress have continued to disturb the organizational equilibrium of agriculture. The impact of these forces has greatly mounted since World War I. In contrast to an earlier period, farmers had begun to assimilate "science" in their culture. The virile seeds of agricultural progress sown in this receptive environment by the colleges has come to fruition in the last 25 years.<sup>6</sup> Application of science not only in agriculture but in the

<sup>4</sup>F. B. Mumford, *The Land-Grant College Movement*; University of Missouri Bulletin 419, July 1940, pp. 33-36; A. C. True, *A History of Agricultural Experimentation and Research in the United States*. Misc. Pub. 251, U.S. Department of Agriculture, 1937, p. 82 ff.

<sup>5</sup>Mumford, *op. cit.*, p. 44.

<sup>6</sup>Cf. *Changes in Farm Production and Efficiency*, Series, Agricultural Research Service, U.S. Department of Agriculture; R. L. Mighell, *American Agriculture, Its*

economy generally has resulted in a dichotomy in agriculture into commercial farming and into what is called low income farming. In addition, almost all of the agricultural processing and marketing activities, once part of the farm household activities, have been split off and are now largely done by large business organizations. Out of technological revolution has arisen a set of problems associated with reorganization of functions within agriculture. Agriculture of today, in terms of organization for research, might be viewed as three broad, separate sectors: (1) commercial farming, (2) underdeveloped farming and (3) processing and distribution.<sup>7</sup>

The commercial farming sector results from an organizational adjustment to general economic progress characterized by the transfer of processing and distribution functions from agricultural production units. Farmers in this sector have been able, because of capital resources and skills, to apply the new technology. They are the equity shareholders of the college of agriculture, and are the dividend receivers of the research results. They are demanding a more comprehensive approach to their problems. They are demanding study of interrelationships of agricultural production and the marketing and distribution sector of agri-business.

The underdeveloped agricultural sector, commonly characterized as the low income sector results from the inability of this sector to adjust to general progress. Commercial farming and market distribution have an affinity in the market economy. On the other hand the underdeveloped sector enters the market economy only in limited degree. Problems of this sector are not resolved in the traditional research program of the college.

Because of their interconnection with markets, commercial farmers have long been interested in research leading to improvements in the distribution of their products. Their interest is partly stimulated by lack of knowledge of distribution processes and price making forces. While innovation and structural change are taking place, the rate of productivity increase in processing and distribution is less than half of the economy's general rate of advance.<sup>8</sup> If we accept the challenge that colleges of agriculture have comprehensive responsibility to all of these broad groups, then it becomes essential that an organizational structure for research be evolved that can be more responsive to this challenge.

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*structure and Place in the Economy.* (New York: John Wiley and Sons, 1955); J. H. Davis and R. F. Goldberg. *A Concept of Agribusiness* (Boston: Harvard University, 1957), pp. 136.

<sup>7</sup> Other structural broad areas might be proposed. There are relative differences in growth of sectors of agriculture as viewed in the broadest sense. There is no longer a single homogenous group of farms but rather several groups in the agricultural setting who look to colleges of agriculture for problem solutions.

<sup>8</sup> A. Barger, *Distribution Place in the American Economy since 1896* (Princeton: Princeton University Press, 1955), Chapter 3.

### *Scope of Agricultural Sciences Research*

The changed organizational "complex of agriculture" occasionally brings to the foreground the question of the proper sphere for publicly supported research. Should such research be confined essentially to farmer production problems as was envisaged in the original land-grant Act? This question has been answered partly in the various federal acts appropriating research funds to agricultural experiment stations. As early as 1925 the Purnell Act authorized investigations "bearing on the production, manufacture, preparation, use, distribution and marketing of agricultural products."<sup>9</sup> Later the Bankhead-Jones Act and the Research and Marketing Act of 1946 provided for further strengthening and increasing the scope of agricultural research. These acts gave recognition to problems lying off farms and interrelated with agriculture and encouraged studies to be undertaken by agricultural researchers in a rather broad field. The public charters in the various acts therefore grant rather comprehensive responsibilities and offer increasing challenges to experiment stations.

### *Need for adaptation of agricultural sciences to problem areas*

The present rigid departmental organizational structure that has evolved in our colleges makes them inadequate for complete identification of problems, and in organizing and directing research activities intended to solve broad problems. A problem usually is attacked by a single department, but the problem setting may suggest a multiple relationship and interrelations with other applied research disciplines. Under this procedure a single discipline solution is offered which contributes only partially to solution of the problem in its setting. This has resulted in a barrage of criticism of agricultural research which is increasing in intensity.<sup>10</sup> In a departmental structure, research and extension activities are oriented toward the promotion of particular practices without full recognition of the impact of these practices on the total revenue position of farmers.

Decision making plays a crucial role in a market economy at the farm level, community level and at various levels of distribution. Decision making involves choice among various production alternatives in relation to input costs and output prices. Typical prescriptions do not offer alternatives, nor can they, because problems are not studied in this framework.

<sup>9</sup> True, *op. cit.* p. 277.

<sup>10</sup> A part of the criticism represents a lack of appreciation of needed basic research, but a part is a legitimate concern for integration Cf. Circular Letter, American Association of Land-Grant Colleges and State Universities No. 18, June 28, 1957 p. 10-11; Statement of Agriculture Committee *A New Reorientation for Agricultural Research*, National Planning Association, 1957.

Physical scientists in various departments typically have not been concerned about these aspects of technical production functions. Unless parts of the public research resources are used to determine technical coefficients of production which lend themselves to economic interpretation for farmers, colleges will continue to face criticism.

Similar integration of research in marketing and distribution is crucial. A large share of the research has not come to grips with problems in this area, because economists, although aware of many of the technical aspects of marketing, have not been able to bring the skills of technicians into the marketing research program. Returns from these resources could have been measurably improved had more integration with technical skills been accomplished. On the other hand marketing funds often have been diverted to support so-called marketing research which in reality was only remotely related. Opportunities for integrated study are particularly appropriate now that more economic and technical personnel are trained to work in this area.

The study of underdeveloped sectors in agriculture and communities has received little emphasis partly because of the inability to identify problems in this area and to organize effectively for this type of research. Because this problem area is so large, a broad spectrum approach is sorely needed. Aggressive and comprehensive research would mitigate one of the major sources of criticism of colleges. Fragmentized solutions that result from lack of integration in this area have contributed political fuel to the fire of agricultural policy debate.

#### *Response to Problems and Identification of Problems*

The mechanism for recognizing, identifying and attacking broad spectrum problems is weak in our colleges of agriculture. One of the reasons for weak transmission and inadequate identification of problems is that a problem usually exists in a multidimensional world. The second reason is that a problem is viewed by a departmental specialist through his own set of disciplinary eyeglasses and consequently only a limited stimulus of its dimension is received. The "pie sections" in Figure 1 represent the view of a single discipline of a problem with a given dimension.

The dimension of the relevant problem is determined in part by the number of disciplines that is, A, B, C, and D whose aid is solicited in identification. The term relevant is qualifying. It must be admitted that a problem is a set of interconnected variables, which could be expanded to include the universe. So relevancy becomes important in terms of the number of sets of eyeglasses used in identification, and in, eventual practical organization for solution in terms of the disciplinary tools applied to the problem. Viewing the problem in a framework of a single discipline is likely to leave a partial eclipse, the extent of which depends



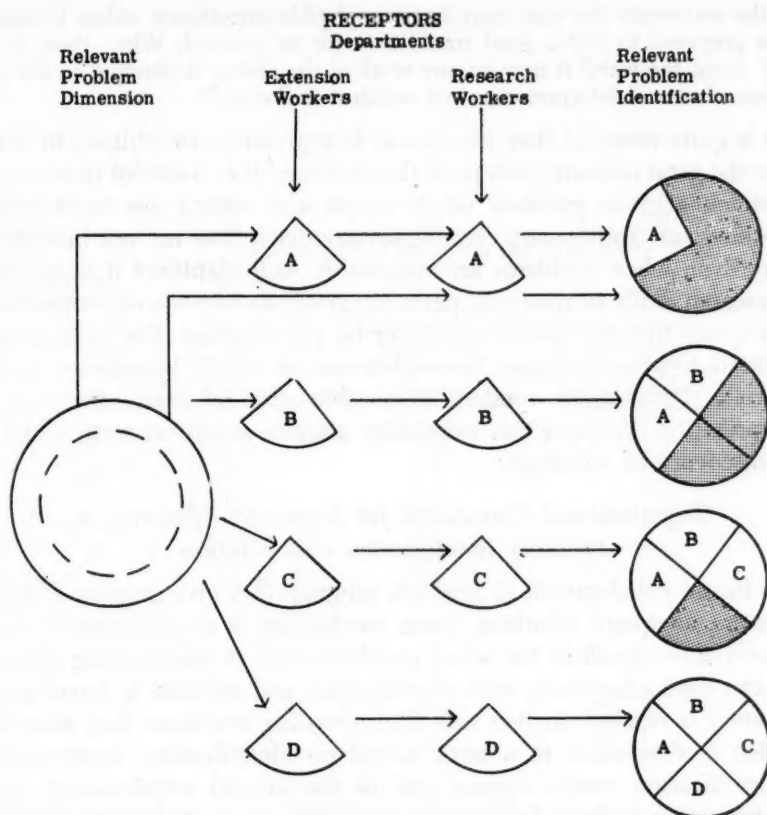


FIGURE 1. PROBLEM IDENTIFICATION.

on the broadness of training and experience of the investigator. A single disciplinary view is not necessarily erroneous or inappropriate, but is usually inadequate for full identification.

In this context I am reminded of the succinct treatment Boulding gives to the task of interpretation of "facts" and observations.

"Theories without facts may be barren, but facts without theories are meaningless. It is only 'theory'—i.e., a body of principles—which enables us to approach the bewildering complexity and chaos of fact, select the facts significant for our purposes, and interpret that significance. Indeed, it is hardly too much to claim that without a theory to interpret it there is no such thing as a 'fact' at all. It is a 'fact' for instance, that Oliver Cromwell had a wart on his nose. But what constitutes this supposed 'fact'? To the chemist it is a certain conglomeration of atoms and molecules. To the physicist it is a dizzy mass of unpredictably excitable electrons. To the biologist it is a certain impropriety in the behavior of cells. To the psychologist it may be the key to the interpretation of Cromwell's character, and a fact of overwhelming importance. The historian may consider it an insignificant detail or an important causative factor, according to whether he follows economic or psychological interpretations of history.

To the economist the wart may be of negligible importance unless Cromwell were prepared to pay a good round sum for its removal. What, then, is the 'fact' about the wart? It may be any or all of the above, depending on the particular scheme of interpretation into which it is placed."<sup>11</sup>

It is quite essential that schemes of interpretation be utilized to determine the total relevant picture of the problem. It is wasteful of resources to attack a given problem where scope and setting are incompletely identified and appropriate complementary disciplines are not brought to bear. Even when problems are reasonably well identified it is wasteful of research skills to dissipate parts for study to various departments in such a way that the results can never be put together. The parts cannot be fitted together because incompleteness of initial hypotheses in the different departments renders impossible any fiduciary decisions in interpretation. Without this possibility science cannot operate at all in the discovery of solutions.

#### *Organizational Framework for Improved Efficiency in Problem Identification and Solution*

To insure development of research program that give promise of offering more adequate solutions, some mechanism is needed that is more responsive to stimuli of the broad problem areas. A coordinating element that can cope adequately with identification and solution in broad problem areas is needed. In line with the preceding argument that adequate solution is dependent to a large extent on identification, improvement in identification would appear one of the crucial requirements of a research organization. Inasmuch as identification of broad problems requires several disciplines, the solution in turn requires integration in research of the contributing disciplines. A schematic diagram of the functional structure proposed is shown in Figure 2. A basic characteristic of this structure is the recognition of three areas of coordination which parallel the three basic broad problem areas described earlier. The Farm Organization and Rural Life area would deal with problems of the Commercial Farming Sector. The Agricultural Industries and Markets Sector would be cognizant of and prepared to work on problems of agricultural business as separate from the farming. Problems of underdeveloped agriculture would be coordinated through the Agricultural Resources and Development area. These three might be called receptor units for research problem identification. Others might be added in time as other broad problem areas evolve.<sup>12</sup>

Each receptor unit headed by a coordinator has a responsibility to

<sup>11</sup> K. E. Boulding, *Economic Analysis* (New York: Harper and Brothers, 1948) p. 5-6.

<sup>12</sup> The functional field of communication is one that might well be added to develop improved external and internal communications of the college.

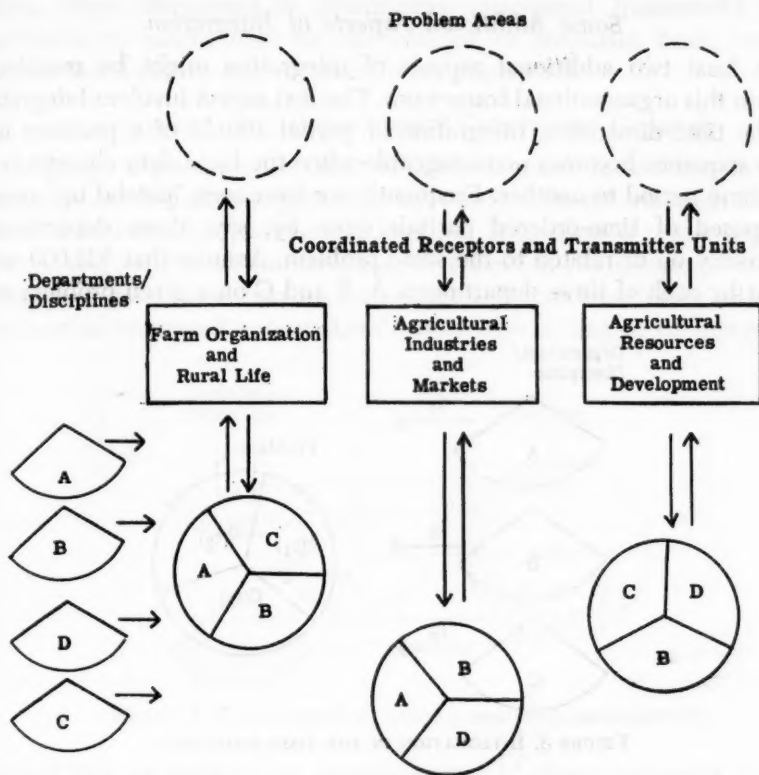


FIGURE 2. ORGANIZATION FOR COORDINATED PROBLEM RECEPTION AND TRANSMISSION.

receive problems for identification; to ascertain emerging problems; to organize for and to assist in developing solutions; and to communicate solutions to the relevant sectors in the social framework of the problem.<sup>13</sup> This task might sound formidable, but it is not unlike the present task of a research administrator, except that at present he is coordinating *inadequate* receptor units. There is a vital distinction in that the structure proposed presupposes at the outset a function of coordination, of identification, of solution, and of transmission of stimuli centered on problem areas. The entire organizational unit would be aware of its role in certain areas. The necessary departmental and disciplinary skills can be brought to bear on problems. The particular composition of the skills would likely vary among the problems attacked within each receptor and transmitter units.

<sup>13</sup> Solutions here are best thought of as awareness of the parameters and variables of the problem and some notion of their behavior. A solution very likely is to be a tentative description of behavior of the parameters and variables with some prescription as to how some variables might be controlled to attain desired action for their control (for man, firm or society).

### *Some Additional Aspects of Integration*

At least two additional aspects of integration might be mentioned within this organizational framework. The first aspect involves integration in the time dimension. Integration of partial attacks of a problem in a time sequence becomes unmanageable when the basic data changes from one time period to another. Frequently we have seen "patchd up" results composed of time-ordered partials done by, say, three departments, ostensibly on or related to the same problem. Assume that \$25,000 were spent by each of three departments A, B and C on a given problem area

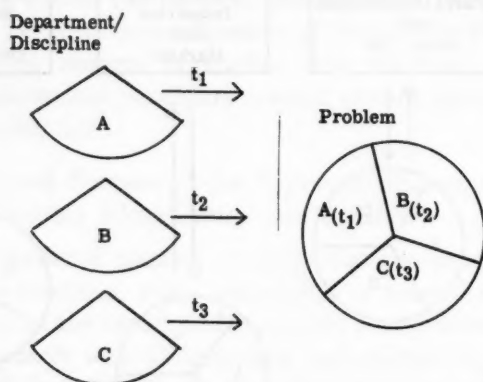


FIGURE 3. INTEGRATION IN THE TIME DIMENSION.

in three different time periods— $t_1$ ,  $t_2$ , and  $t_3$ . (Figure 3). Identification is likely to have suffered, as there will likely be interrelated connections between the studies in the three departments. Because of changes in basic data and differences in the selection and in measurement of relevant variables, the partial studies cannot be usefully combined. If the three departments or disciplines involved had been integrated in a team effort in a single period much more comprehensive results could have been obtained at less total cost. A team effort might also prevent the frequent situation in which research has been stopped short of valid results partly because of inadequate identification or imperfect statistical methods and/or weaknesses in conceptual methodology. The implications for adequacy and for economy of research are obvious.

The second aspect includes the notion of "tool sharpening" or stimulation of basic research. Weaknesses of a particular discipline in a particular problem solving situation often become quite apparent in an integrated effort (Figure 4). Frequently the questions raised by persons representing a complementary discipline bring out weaknesses in methodology, or in a particular facet of the conceptual framework of the discipline not uncovered in the more restricted atmosphere of the department or disci-

pline. Gaps discovered in disciplinary conceptual frameworks or in methodology might well be the catalyst to stimulate basic research within the departmental or disciplinary framework.

### *Voluntary Inter-Departmental Cooperative Research*

Although a considerable effort is made at many institutions to foster cooperative research, integration of science for effective research involves more than mere cooperative relationships. It involves a rather complete integration in problem identification, in utilization of appropriate methodology and joint execution of the research. It involves "brain storming" sessions of interested and qualified researchers willing to submerge indi-

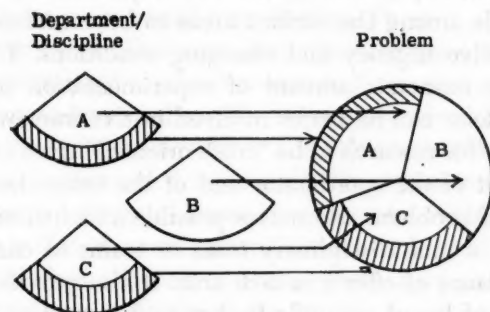


FIGURE 4. BASIC RESEARCH STIMULATION (TOOL SHARPENING).

vidual gain or prestige for the attainment of objective results. Our experience at the University of Missouri, where Agricultural Economics, Animal Husbandry, and Home Economics have been carried on joint research in consumer preference for meat for five years, is that the research project must be jointly planned and jointly executed. The burden of carrying on the physical aspects of the experiments must be shared as well as interpretation and presentation of results. The real integration of research encourages spontaneous effort on the part of individuals for integrated research.<sup>14</sup>

The primary purpose of the proposed organizational framework is to foster integration for research. Other aspects are worthy of further comment. The traditional departmental organization is retained (Figure 2). Each department represents a pool of specialists skilled in the application of basic sciences to problems encompassed in the work of the depart-

<sup>14</sup> A body of literature on research administration is growing Cf. G. P. Bush and L. H. Hattery, *Scientific Research: Its Administration and Organization* (Washington: American University Press, 1950); Bush and Hattery, *Teamwork in Research* (Washington: American University Press, 1953); various proceedings issues of Annual conferences on the Administration of Research, at University of Georgia, Columbia University and University of Michigan.



ment. Each has a responsibility of maintaining the competence of its staff. The growth and development of the basic science associations and the various professional applied associations of specialties are in a sense self-governing institutions to safeguard the organized practice and premises of each specialty.<sup>18</sup> No researcher should be coerced to work on the team, as many workers will be adaptable and willing to contribute and actively support integrated research. I sincerely believe there is a latent desire on the part of many skilled researchers to engage in such efforts.

Flexibility in allocation of effort and resources to the broad applied problem areas can be obtained easier under the proposed organization than under rigid departmentalization of ten or more departments. Given Y number of dollars, administrators can adjust rather rapidly the resources available among the various areas to be coordinated, depending upon their relative urgency and changing conditions. The ever-present problem of the economic amount of experimentation to carry out on particular problems can be better resolved in this framework. There will be less tendency for research to be "crash oriented" since continual awareness on the part of the coordinator and of the teams keeps researchers better abreast of problems and makes possible anticipation of developing problems. Also, a multidisciplinary team or teams in each applied area can provide balance of efforts in each area. It also provides a mechanism and a bulwark of broad scientific background to protect the administration from narrow public pressure groups.

### Summary

The historical development of experiment stations represented adjustment to the needs of rural population. The departmentalization that evolved was productive because specialization by departments produced a body of knowledge useful in teaching and to special interest groups. This type of organization had in a sense an accidental genesis but it was useful in gaining support for agricultural experimentation. However this very specialization has produced research arterio-scleroses. It is less than optimally adaptable to the solution of broad problems of the agricultural environment it helped to produce.

The frontiers in progress are not the frontiers of science narrowly conceived in a disciplinary context. The real frontiers are conceptual frameworks. Science is the process of synthesizing a web of interconnected concepts and conceptual schemes arising from joint experiments and observations which are fruitful of further experiments and observations. Progress means changes in a multidimensional social en-

<sup>18</sup> M. Polanyi, *Science, Faith and Society* (London: Oxford University Press, 1946), p. 36-38.

vironment; science means perception in a changing multidisciplinary context. Both depend on man's ability to perceive and adapt in a dynamic environment.

Although we have a long tradition of departmental orientation we must reorient the organizational framework to solve broader problems and at the same time retain professional departmental identity to support basic research responsibility.<sup>16</sup> This reorientation requires in addition to the appropriate administrative changes to service it, an awareness by the administration and researchers generally of their public responsibility. Inordinate allegiances to the departmental goals must be submerged. Failure to do so means a steadily decreasing role of agricultural experiment stations in society. It means less opportunity for each discipline or department to make its potential contribution. There is a harmony in all of science. Farmers and other have assimilated science in their culture. They expect answers that are harmonious in their setting.

The role of economics as a discipline is based on coordination of means to given ends in the social framework.<sup>17</sup> The role of agricultural economics in aiding in adjustments needed in research integration to ends prescribed by public charter in colleges of agriculture must be evident. The essence of the discipline is that of coordinating the various parts of given physical and psychological data adapted to social goals. Agricultural economics has much to contribute. Outside of the role of coordination, economics has little to contribute except in macroanalysis. Therefore an important avenue for improvement in agricultural economics research and its contribution to problem solution lies in more effective integration with other research disciplines.

<sup>16</sup> Basic research has different ends from applied research and different conditions of cultivation must be provided. Cessation of progress in pure science would remove the foundations of applied science. Public responsibility however, guides allocation of some of our resources to applied efforts although the public is likely to be unaware of the fundamental need for basic research. Cf. M. Polanyi, *The Logic of Liberty* (Chicago: University of Chicago Press, 1951), Chapter 5; D. L. Watson, *Scientists are Human* (London: Watts and Co., 1938), Chapters 3 and 4. For another view, Cf. J. D. Bernal, *The Social Function of Science*. (New York: Macmillan and Co., 1939).

<sup>17</sup> J. B. Conant, *Science and Common Sense* (London: Oxford University Press, 1931), p. 39.

## DISCUSSION: INTEGRATION OF THE SCIENCES FOR EFFECTIVE RESEARCH

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Almost everyone in the profession has spoken some kind words about interdisciplinary cooperation in research. Perhaps it is about to become

one of our sacred cows. Professor Kiehl has added to the chorus of praise and has constructed something of a method as well. I choose to comment on both the method and on the interdisciplinary idea itself. Along the way a difference of opinion between Kiehl and myself emerges.

Cooperation among sciences is not new. But the lines between disciplines have often shifted. Thus, new routes of communication are needed from time to time. Also, the introduction of new techniques, such as experimental design, into agricultural research, itself suggests an earlier start in project cooperation.

As disciplines have become somewhat distinct, the idea grew up that the best way to get them back together is through a team effort. Kiehl finds it unfortunate that so much joint work is only consultive, not real team effort. Teamwork is wonderful, almost by definition, since it denotes selflessness. But research scientists are often very individualistic. Our individualism is a part of our kit of tools. It permits us to go off in strange directions without feeling self-conscious. In being asked to submerge this individualism for the team, we are being asked to throw away part of our tools. We ought to expect something very good in return.

Although admitted by Kiehl to be worthwhile in some situations, individualism has also been put in its place by another member of our profession.<sup>1</sup> According to Tolley, "The goal in putting the team together is to gradually mold the individualist, so that while retaining a degree of his individualism he nevertheless inclines more and more toward group approach, group-thinking, team-thinking." It is also suggested that majority rule seems to be a good way to bring the individualist around.

Not everyone is so keen on the teamwork idea. A British author in 1949 said, "Today teamwork in scientific research has become something of a fetish."<sup>2</sup> Another said:<sup>3</sup> "Perhaps I may be permitted to express scepticism about the teamwork in science which is nowadays fashionable. . . . At its worst a team becomes a device for "passing the buck" from one member of the team to another, a mere piece of machinery which survives although there is no external machinery to drive it."

Both these statements are relevant to our profession. A good deal of our cross-fertilization, quoting Schumpeter ". . . might easily result in cross-sterilization."<sup>4</sup> Research by team may be used as a leveling device

<sup>1</sup>Howard R. Tolley, "The Individualist and the Research Team," *Teamwork in Research*, edited by G. P. Bush and L. H. Hattery, Washington, American University Press, 1953, p. 80. The book offers balanced pro and con arguments.

<sup>2</sup>Paul Freedman, *The Principles of Scientific Research*, London: McDonald and Co. 1949, p. 135.

<sup>3</sup>W. L. Balls, "Cotton: Years of Experiment," *Journal of Textile Institute*, Vol. 42, No. 8, August, 1951, p. 319.

<sup>4</sup>J. A. Schumpeter, *History of Economic Analysis*, New York: Oxford University Press, 1954, p. 27.

within disciplines, and as a substitute for strenuous, scholarly effort in an interdisciplinary problem.

I have searched Kiehl's paper without success for some suggestion that the real heart of the problem, the real key to integrated, objective research, is the basic unit of research effort, you and me. If we have prepared ourselves in the literature of related disciplines, there is not a great deal to be added by the team. And no amount of conversation can take the place of tedious effort in preparation for problems of broad scope. This is obvious, some may say. Yet, I am sure many of us harbor the hope that there is a way to avoid serious study in new areas. The media in which we pursue our folly are meetings, team projects, massive project outlines, and seminars.

I suggest that the quoted examples of successful integrated research have been distinguished less by the team effort than by the adequate foot-slogging individual research. Further, I doubt that anyone really submerged "himself" for the team effort. Some compromises were made, but no one has remained anonymous, and for good reason.

I suppose it is clear by now that I think integrated research is largely an individual matter. The team may only hinder the man with the idea, unless of course, the team is subordinate, a different situation.

I am pessimistic about the addition to be made integrated research by organization. In no case is a favorable administrative environment a substitute for leadership by a research scientist. The well-known examples of success in our area would have been successful in any but the most coercive administrative environment. There is no reason to believe they would have been more successful in Kiehl's "favorable environment."

Kiehl noted that the mechanism for identifying broad problems is weak in our colleges. He deplores the fact that no effective avenue exists to facilitate problem recognition. I submit again that it is people who recognize problems, and people who become interested in solving them. If I want to ignore other areas, I can do it in any environment. The three pronged receptor unit visualized earlier offers nothing that is not already possible, if only someone wants to do the job.

Many of you have seen an article published last year in a popular journal entitled, "Let's not get out the vote." May I say a word about not being interdisciplinary. Professor Robertson of Cambridge has a perceptive article entitled "On Sticking to One's Last" in the 1951 *Economic Journal*. He is suspicious of the economist posing as the complete man in everything, I suppose, from agronomy to ethics. Perhaps we need to look a little more closely at the alternative marginal productivities of group and individual effort before running off in too many directions at the same time.



## WATER PRODUCTIVITY AND PROBLEMS

Chairman: Carl P. Heisig, Agricultural Research Service, USDA

### THE PRODUCTIVITY OF WATER IN AGRICULTURE\*

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*Department of Agriculture, Canada*

MUCH of the discussion by economists of the use of water in agriculture has centered on the consideration of institutional factors. The adequacy of legislation concerning water rights, the role of government agencies in water resources development, and other similar problems are, of course, important. But, in the emphasis given to the above type of problems, we have left aside to some extent the type of analysis that slices through the whole maze of complexities. Information on the value of water in different uses would enable us to have more to say about needed directions in the re-allocation of water.<sup>1</sup>

General comments only can be made concerning the productivity of water in United States agriculture as a whole. With a relatively fixed quantity of land—the main input that is a substitute for irrigation water—and with increasing inputs of such items as fertilizer and seed, which are complements of irrigation water, the productivity of a given amount of irrigation water would increase. Looking at the matter from the opposite point of view, many people have stressed the importance of increasing the use of these complementary inputs when the use of irrigation water is started or increased.<sup>2</sup>

Because of the extremely high transportation costs of water services, we must concern ourselves with a series of local markets.<sup>3</sup> The attempt to draw general conclusions has frequently led writers to overstate the degree of divergence from an optimum allocation of water as between irrigation and other uses. While I think that in many areas water could be more profitably put to other uses than irrigation, comparisons of values are frequently made that are misleading. The sources of error are frequently a comparison of gross output per unit of water in industry with that in agriculture, or the neglect of differences in transportation and

\* The ideas expressed in this paper grow out of work done while the author was a member of the Natural Resources Group at the University of Chicago.

<sup>1</sup> I will limit my discussion to the irrigation use of water in agriculture.

<sup>2</sup> See for example: K. H. Beauchamp, "Irrigation Guide for North Central States," *Agricultural Engineering*, Volume 36, January 1955, p. 31; R. J. Penn, "Water Policy in Humid Areas," *Journal of Farm Economics*, Volume XXXIV, Number 5, December 1952, p. 757; O. J. Scoville *et al.*, *Irrigated Farms in A Subhumid Cotton Area*, Circular 980, USDA, May 1956, p. 28.

<sup>3</sup> This is not so to the same extent for labor or for capital as a whole.



other costs. The source of water may be close to where it is presently used in agriculture but far from where it is contended that it would be much more profitable to use it in industry. Examples of misleading statements are the following:

The use of water for irrigation is extremely uneconomical when compared to industrial uses.<sup>4</sup>

Relative to many other uses, irrigation is a very uneconomic user of water.<sup>5</sup>

Such statements detract from the valid points that can be made in looking at local situations such as residential and industrial versus irrigation uses in Southern California, or the use of water for hydroelectric power as compared with irrigation in, say, Central Nebraska. In both of these local situations some water could profitably be transferred from agriculture to the other uses.

We are concerned here with the manner in which one might obtain estimates of the demand for water on individual farms in a particular area. I am going to assume that the prices of all factors other than water are fixed to the individual farmer as are also the prices of the products he sells. With increasing amounts of water being used, our farmer finds it profitable to increase the use of complementary inputs and thus he moves from one marginal productivity schedule to another. We, therefore, have a series of equilibrium rates of water use with varying prices for irrigation water.

The demand schedule is a function of the prices of products and factors other than water. If these prices remain relatively stable from year to year the demand for irrigation water will remain relatively stable—providing that precipitation is about the same each year. This is the situation in arid regions. However, where there is some rainfall, the demand schedule will shift. In the East where there is a good deal of rainfall, the demand for irrigation water will be a function of the distribution of precipitation during the growing season, rather than the total amount.

In the West water is usually available at the high point on the farm and one can obtain price-quantity relationships at this point. Water is generally distributed on the farm by gravity. In the East, however, where each irrigation is usually less than 2 inches, most farmers distribute water through sprinkler systems. Because of this fact it is less realistic to deal with the demand for irrigation water at the high point on the farm.

<sup>4</sup> S. T. Powell, "Relative Economic Returns from Industrial and Agricultural Water Uses," *Journal of the American Water Works Association*, August, 1956, p. 991.

<sup>5</sup> The President's Materials Policy Commission, *Resources for Freedom* (usually referred to as the Paley Report), Volume V, *Selected Reports to the Commission*, U.S. Government Printing Office, June 1952, p. 86.

Some concept of the demand for irrigation water exclusive of the distribution costs on the farm is useful, however, because we must push back to this point and beyond when we become concerned with questions of reallocation of water.

We want to be able to obtain quantitative estimates of the demand curves in the various situations. One approach (at least in the West) would be to consider the market for land, taking a cross-section of farms (or groups of farms) with water rights to various quantities of irrigation water. These would have to have similar soils and be located in a relatively homogeneous climatological area. Such data are not available at the present time. County data are available and these permit rough estimates of the aggregate value of irrigation water in counties—the value of the particular amount actually available—if we assume a relatively perfect land market. The fact that Bureau of Reclamation projects typically involve a “full” supply of irrigation water means that there is only a small degree of variation in the rate of water application on projects in areas with the same climatological conditions. One accordingly cannot learn much about the differences in land values associated with different applications of water.<sup>6</sup>

In certain areas one could look at the market for water itself—either water rights or water. In Colorado for example, water rights are not appurtenant to land and many transactions involve only the sale of water storage rights. Also, those with rights to storage water sell water. I have been in touch with a number of agencies who might have had data but I was not able to obtain the type of data needed. One might obtain data on transactions in water or water rights, however, from the ditch companies in the area. I think that this would be a fruitful approach to work on the demand for water in the Missouri Valley.

Another method would be to consider price-quantity relationships on farms where the irrigation is from wells. I have used this procedure in estimating the demand for irrigation water on farms in the Ainsworth area of Nebraska, and I will discuss it at some length in order to illustrate what is involved.

Let us consider a group of pump-irrigated farms on a particular type of land. Farmers planning to use water on pump-irrigated farms would presumably equate the present values of the long-run value of the marginal product of water to the long-run marginal cost of water. This would involve discounting of probability distributions of future events on both sides of the scale. Once the decision had been made to install a pump-irrigation plant of a given size, a farmer would equate the

<sup>6</sup> A comparison of irrigated and dryland values, taking into account land improvements and payments for water, is extremely useful, however, in estimating the value of the actual amount of water made available.

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short-run value of the marginal product to the short-run marginal cost of water. The usefulness of the pump-irrigation data stems from the fact that we would have a situation where farmers with similar land are faced with different costs of water (both short and long run) because of the variation in the depth of the water table below the surface of the land.

Among our pump-irrigated farms on a particular type of land, we have a variation in the total acreage irrigated. This causes no problem if we can assume that pumping equipment can be varied in size to pump any quantity of water from a given depth at the same cost per acre foot—i.e., that the minimum cost per acre foot can be assumed to be the same for a considerable range of pump sizes. However, this assumption would not appear to be realistic.<sup>7</sup> This does not result in any difficulty if several wells can be drilled on a farm without affecting each other. It would appear that a well could be drilled on each 40 acres in much of the area where pump-irrigation is practiced in Nebraska.<sup>8</sup> The average acreage irrigated per well in the period 1948-53 was about 60 acres for the state as a whole and for most counties it was considerably above 40 acres.<sup>9</sup> Thus, it is reasonable to assume for our purposes that farmers are faced with an infinitely elastic supply of groundwater.

Although each individual well might not affect an adjacent well, a problem that might be expected to arise in many areas of pump irrigation is the treatment of the decline in the water table. This does not appear to be a consideration that has to be introduced in dealing with Nebraska farms because the decline in the last few years can be explained almost entirely by the below-normal precipitation.<sup>10</sup> Also, the 1948-50 period for which I have pump-irrigation records is mostly previous to even the recent slight decline.

<sup>7</sup> The maximum fuel requirements for a good pumping plant to lift a gallon of water one foot are assumed to be the same regardless of the capacity of the well in the following article: P. E. Schleusener, J. J. Sulek, and J. F. Schrunk, "How Efficient is Your Pumping Plant?," *Nebraska Experiment Station Quarterly*, Spring, 1955. However, we have such statements as the following: "Under identical conditions, the larger the casing, the more the flow; consequently the drawdown is less. However, the yield does not increase in proportion to the diameter of the casing. In most cases the yield from the well with the larger size casing is not enough better, however, to pay for the extra cost," W. E. Selby, *Questions and Answers on Irrigation Wells and Pumping Equipment* (Kansas State College; Manhattan, Kan., June 1948), p. 2.

<sup>8</sup> "Under ordinary conditions there should be very little effect of drawdown while pumping on water levels in neighboring farm wells if the irrigation wells are 1 thousand feet or more distant and the effect at 5 hundred feet is usually not great," E. C. Reed, "Groundwater Development in Nebraska Continues to Expand Rapidly," *Nebraska on the March*, IX (October, 1956), 5.

<sup>9</sup> *Nebraska Irrigation Statistics, 1949-53*, Nebraska Department of Agriculture and Inspection, cooperating with United States Department of Agriculture (Lincoln, Nebraska, September 1954), pp. 6-11.

<sup>10</sup> Reed, *op. cit.*, p. 4.

As I mentioned, I have used data on farms where the irrigation is from wells to estimate the demand for water in the Ainsworth area of Nebraska. My interest in the Ainsworth area stems from the fact that a 34,000-acre irrigation project is planned for this area. The project is in northwestern Nebraska in the Niobrara river basin. Soils in the area to be irrigated are mostly fine sandy loams. The soils were classified by the Bureau of Reclamation as classes 1 to 3. I have treated them all as one group in estimating the demand for irrigation water. This can be done if we assume that the only difference among the land classes in this area is the fixed cost associated with land levelling, etc., and that once these development costs have been incurred the value of each unit of irrigation water is the same on all classes of land.<sup>11</sup> The only difference among the demand curves would be that the high-price part of the demand curve would not exist for the classes of land for which development costs were high.

I had access to 30 records on pump-irrigated farms on soil types corresponding with those found in the Ainsworth area.<sup>12</sup> All of the 30 observations were for 1950. The wells were installed between 1938 and 1948. Expectations concerning prices of products relative to costs, as well as the cost of wells and pumps at the time of installation, would be expected to have some effect on the size of well. I have not brought these considerations explicitly into the results that follow and this is a limitation which should be borne in mind.

Let us assume that the relationship estimated from 30 observations on all the land classes adequately describes the demand relationship on each acre of land in the Ainsworth area. Then we have the following equation, using least squares:<sup>13</sup> (The standard errors of the coefficients are indicated in parentheses.)<sup>14</sup>

<sup>11</sup> House of Representatives, Eighty-Third Congress, First and Second Sessions, Hearings before the Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs, *Niobrara River Basin, Nebraska*, October 9, 1953 and April 26, 1954 (Washington: Government Printing Office, 1954), statement of Clyde E. Burdick, area engineer, Bureau of Reclamation, Ainsworth, Nebraska, p. 19. "The class 2 land is probably just as productive as the class 1 land. It may cost more to develop that land, and that is why it was put down into class 2."

<sup>12</sup> I am indebted to Professor A. W. Epp of the Department of Agricultural Economics, University of Nebraska, as it was through him that I gained access to these pump-irrigation records.

<sup>13</sup> I considered the possibility of using some of the variables in logarithmic form. For 17 of the observations (those on class 1 land), the results were not improved when logarithms of  $X_1$  and  $X_2$  were used. The form of the relationship depends on the use to which one expects to put the results. I was interested in estimates of the area under the demand curve. This involved some extrapolation beyond the range of the observed points—the lifts for the 30 wells varied from 58 to 181 feet.

<sup>14</sup> The coefficients of  $X_2$  and  $X_4$  were significantly less than 0 and that for  $X_3$  significantly greater than 0 at the levels indicated (\* denotes 1 per cent; \* denotes 5 per cent).

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$$X_1 = 246.77 - 0.618^* X_2 + 0.0549^* X_3 - 80.88^{**} X_4 \quad R^2 = .64$$

(.26)                      (.30)                      (18.0)

The variables were as follows:

- $X_1$  = acre-feet of irrigation water (times 100) pumped per acre during the 1950 season.  
 $X_2$  = the lift in the well in feet.  
 $X_3$  = the rate of discharge of the well in gallons per minute.  
 $X_4$  = the precipitation during the 1950 growing season in feet (April to September, inclusive). This was estimated for each farm from the records of the nearest weather reporting station. These would be up to about 15 miles from the farms and, with the pattern of summer storms in Nebraska, there could be considerable error in these estimates for the precipitation on the individual farms.

The above equation can be considered to represent the demand for irrigation water. It also indicates how the quantity of water demanded per acre shifts with the level of precipitation. We can move from this to a concept of the long-run demand for irrigation water if we assume that the long-run quantity of water demanded is the average amount demanded over a period of years. The equation for our long-run curve is simply the above equation with the mean level of growing season precipitation substituted for  $X_4$ . For the 25-year period, 1928-52, the mean Ainsworth growing-season precipitation was 1.31 feet.<sup>15</sup> If we also take the mean rate of discharge ( $X_3$ ), which is 958 gallons per minute, we obtain the following relationship:

$$X_1 = 193.64 - 0.618 X_2$$

The elasticity of demand for irrigation water at the average lift is — 0.5.

In the above pump-irrigation equation, the cost of water is designated by feet of lift. I would like to translate the lift in feet to a dollar price for irrigation water. I will be concerned with the total cost of water rather than just the short-run costs. The following pieces of information bear directly on the translation into dollars:

A modern plant, operated 1,000 hours or more a season, should pump water at a total cost of about 5 cents per acre-foot per foot of lift. If the plant is old and inefficient or if the plant is run for only a short period each season, the total cost may be doubled.<sup>16</sup>

The average cost per acre-foot for the 283 wells was \$7.56. Fixed costs averaged \$4.07 and variable costs \$3.49.<sup>17</sup>

If the pumping units are equally efficient, the cost per acre-foot per foot of lift should be the same on shallow wells as on deep wells.<sup>18</sup>

<sup>15</sup> The mean growing-season precipitation for the 30 observations was actually fairly close to this—1.37 feet.

<sup>16</sup> United States Department of Agriculture, *Water, the Year-book of Agriculture*, 1955 (Washington: Government Printing Office, 1955), p. 293.

<sup>17</sup> A. W. Epp, *The Cost of Pumping Water for Irrigation in Nebraska*, Bulletin 426, Nebraska Agricultural Experiment Station (Lincoln, Nebraska: November 1954), p. 7. The average lift was 98.8 feet.

<sup>18</sup> October 17, 1956, letter from P. E. Fischbach, Extension Engineer, University of Nebraska, Lincoln, Nebraska.



The Nebraska study, which indicates an average cost per acre foot of \$7.56, dealt with costs at the 1950-51 level. Total costs per acre-foot per foot of lift averaged \$.0765. (An interest charge of 5 per cent on the investment is included.) This rate is not inconsistent with the first statement, which presumably refers to the situation in 1955.

Let us use \$.0765 per acre-foot per foot of lift, assuming that this rate represents the long-run marginal cost.<sup>19</sup> Applying this rate to the equation on the previous page, we obtain the following "long-run" demand curve:

$$X_1 = 193.64 - 8.08 X_2,$$

where  $X_1$  = acre-feet of irrigation water pumped per acre (times 100), and  $X_2$  = price per acre-foot in dollars.

I have obtained an estimate of the demand for irrigation water on farms in the Ainsworth area from cross-sectional analysis of information on pump-irrigated farms, relating the rate of water use per acre to the lift in the well and other variables. Future work with more complete data on pump-irrigated farms or with other types of information on the market for water should enable us to draw more precise inferences about the nature of the demand for irrigation water. There is a danger of being misled, however, by the almost complete reliance by the Bureau of Reclamation and other agencies on estimates of the value of water obtained by setting up farm budgets for the dryland and anticipated irrigation situation.<sup>20</sup> I do not wish to imply that such budgets are not

<sup>19</sup> Farmers' decisions on rates of water application in the year of the observations would be related to short-run marginal costs. All of the 30 records were taken in 1950. This was a year of average precipitation during the growing season in western Nebraska—13.9 inches as compared with the long-run average of 13.8 inches. Farmers in installing pump-irrigation plants would go to capacities for which average total costs were at a minimum in years of average precipitation. For such years, the short-run marginal costs would be equal to the average total costs.

It might be argued that farmers install pump-irrigation plants with minimum average total costs in years when precipitation is somewhat below normal. If so, marginal costs would be below average total costs in a year of average precipitation. If we assume that variable costs are constant up to the capacity of the plant, and that in 1950 all farmers were pumping below capacity, the marginal costs would be equal to the average variable costs—\$.0353 per acre-foot per foot of lift. If this were the case, the demand curve would be to the left of that indicated by the above equation. It would be:

$$X_1 = 193.64 - 17.51 X_2,$$

Presumably, the correct estimate of the demand curve would lie somewhere between these two extremes.

<sup>20</sup> In my report on "The Demand for Irrigation Water in the Ainsworth Area of Nebraska," University of Chicago, Department of Economics, Agricultural Economics Research Paper No. 5704, June 17, 1957, I developed budgets for various levels

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useful in certain engineering aspects of project planning. Nor would I contend that farm budgets are not a useful framework in gaining an understanding of the types of adjustments that take place as the quantity of water available varies. However, most of the present use of budgets in the planning of irrigation projects is limited to the estimation of a crop production pattern and a calculation of *the* quantity of water "required" for these crops. An important limitation in the Bureau of Reclamation planning that stems from this approach is the extent to which the Bureau makes decisions that might better be left to a greater extent in the hands of the individual farmer. Irrigation water is allocated almost entirely by rationing in spite of the absence of knowledge of the value of incremental quantities of water to the individual farmers. Once allocated in this manner, the institutional framework apparently prevents any reallocation among project farmers.<sup>21</sup>

I would like now to comment briefly on the productivity of water in several areas of the United States. We can observe the equilibrium position for the typical farmer in a number of areas, if we assume that farmers equate the long-run value of the marginal product to the price of water. In the Ainsworth area, the average well lift is about 100 feet. The above equation indicates that with this lift (equivalent to a price of \$0.64 per acre inch) the average use of water will be 16 inches per acre. Comparisons with data for Texas and California—where there are extensive developments of pump-irrigation—and with the average for the 28 Eastern states are provided in Table 1.

Although the data in Table 1 are of limited application, they suggest that in a number of areas a good deal of information has been collected that would be useful in a consideration of the demand for water in agriculture. By analyzing this with similar information on the demand for water in other uses, one could evaluate decisions concerning the allocation of water. This evaluation would, of course, be useful in drafting changes in water rights legislation, a problem in many states at the present time.

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of irrigation water input, using adjusted experimental data on the response in yields to the rate of water use and empirical data on the change in the proportion of the land in various crops as the rate of water application varies. In obtaining residual estimates of the value of water in this manner there is the likelihood of extremely large errors. This would be even more of a problem in a humid area where water would be an extremely small part of total inputs.

<sup>21</sup> For the Ainsworth project rationing of equal quantities of water per acre to all farmers may be the optimum procedure, leaving aside differences in cost of transporting water to the farms. On the Columbia Basin project, however, where the base quantity of water per acre is varied by soil type, what type of information was used to get at the value of incremental amounts of water?

TABLE 1. PRICE-QUANTITY RELATIONSHIPS FOR IRRIGATION WATER IN VARIOUS AREAS OF THE UNITED STATES

Region	Period	Price per acre-inch (excluding distribution costs)	Rate of Use
		\$	—inches per acre—
Ainsworth, Nebraska	1948-50	0.64	16
High Plains, Texas <sup>a</sup>	1947-49	0.77	11
Antelope Valley, California <sup>b</sup>	1946-52	1.00	60
Average 28 E. States <sup>c</sup>	1954-55	0.49	5

<sup>a</sup> Calculated from data in Bulletin 745 and 756, Texas Agricultural Experiment Station.

<sup>b</sup> Rough calculations from an article by J. H. Snyder, "On the Economics of Ground Water Mining—A case study in an Arid Area," *Journal of Farm Economics*, Volume XXXVI, Number 4, November, 1954, Table 1, p. 603. The rate of water use of 60 inches is that for alfalfa, the most important crop in the area in terms of acreage, and the one on which the highest rate of application is used. This rate of water use is therefore, not comparable with those for the other regions.

<sup>c</sup> Calculated from data in the 1955 Census of Agriculture, *Irrigation in Humid Areas*. I obtained from Table 10 the cost of reservoirs and wells, assumed a 20-year life of these facilities and an interest rate of 5 per cent. I obtained the average number of irrigations from Table 16 and assumed an average rate of application of 1.5 inches.

## DISCUSSION: PRODUCTIVITY OF WATER IN AGRICULTURE

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I would like to comment not only on Mr. Dawson's presentation itself, but also on the research paper published by the University of Chicago office of Agricultural Economics, entitled "The Demand for Irrigation Water in the Ainsworth Area of Nebraska," on which today's presentation rests.<sup>1</sup>

The title of the paper you have heard is "The Productivity of Water in Agriculture." A more descriptive title might have been, "The Demand for Pump Irrigation Water in 1950 for selected farms in Nebraska for which records were available." This might have given a better idea of the nature of the analysis and some of its limitations.

The stated purpose is to construct a demand curve for irrigation water on the Ainsworth project in Nebraska. The analysis is based on a single year's experience of 30 farmers in Nebraska who had installed pump irrigation systems at different times from 1938 to 1948.

Quite apart from the difficulties involved in transposing the economic decisions from one area to another and from one time period to another (1938-1950 to 1957) there are other serious limitations to this type of analysis.

<sup>1</sup> John A. Dawson, "The Demand for Irrigation Water in the Ainsworth Area of Nebraska," University of Chicago, Research Paper No. 5704, June 17, 1957.

The equation developed is based on the assumption that each of the 30 selected farmers acted as "economic men" and that therefore their experience can be used to indicate what constitutes the most economic allocation of scarce water. This assumption is open to serious question. There certainly are years in which considerations other than the marginal costs of variable inputs are the strategic factors in the decision-making process.

The demand analysis is also based entirely on the variable costs and ignores the fixed costs despite the fact that on an annual basis the latter are usually higher than the former. I suspect that once a farmer has decided to install a pump irrigation system he is almost forced to use the system to its maximum capacity during the growing season. This is particularly true in the arid and semi-arid areas. A study of leasing arrangements on pump irrigated farms in Nebraska revealed that one landowner who owned several irrigated farms encouraged the tenants to operate the pumps continuously during the full growing season. The encouragement took the form of paying for the entire system as well as for all the fuel necessary to operate the pumps. This particular landlord and his tenants were considered among the most successful in the community. Experience in this case would discount the validity of placing undue emphasis on variable costs in constructing a demand curve.

The analysis is also based on other unrealistic assumptions, such as:

- (a) "The quantity of land input is constant."
- (b) "If prices remain relatively stable from year to year, the demand for irrigation water will remain relatively stable—providing that precipitation is about the same each year."
- (c) "It is reasonable to assume that farmers are faced with an infinitely elastic supply of groundwater."
- (d) "There is a direct relationship between the depth of well and the amount of water pumped," etc.

While it is not too clear how the demand curve would be used it is suggested that this procedure would make possible a more effective allocation of water among farmers. Marginal productivity analysis would be used as a guide in the allocation of water rather than the administrative rationing now being used on federal irrigation projects. This procedure would presumably result in optimum economic allocation of the scarce water. In presenting this idea Dawson suggests that the Bureau of Reclamation procedures are inadequate. I think the criticism of the Bureau of Reclamation in this case is entirely wrong because farmers and the Courts have found that when water is scarce it must be rationed amongst individuals through group action in accordance with a concept of "reasonableness" which cannot rest entirely on a free market concept. In federal irrigation districts in the West, local

organizations work with representatives of the Bureau of Reclamation in formulating what constitutes a reasonable allocation of scarce water. This has proved more workable than strict reliance on the price mechanism.

Dawson also suggests that this type of analysis could be helpful in evaluating decisions concerning the allocation of water among competing uses. He makes this statement after dismissing as misleading and erroneous the work of the Paley Commission<sup>2</sup> on this subject. The Paley Report indicates that relative to many other uses irrigation is a very uneconomic user of water. The gross value of irrigated crops for a given year is reported to be equal to about 10 cents for each 1,000 gallons of water withdrawn. In comparison the value added by manufacture is equal to about \$5 for each 1,000 gallons withdrawn. Furthermore the consumptive use of water by irrigation was 5 or 10 times as great as for manufacturing. This is based on gross returns but it does give a strong indication of the value of water for irrigation as opposed to industrial use.

Although there may be some merit in limiting the subject to "an indication of how one might obtain estimates of the demand for water on individual farms in a particular area" I doubt the wisdom of dismissing as erroneous or misleading the work of other writers who deal with the problem of competing uses and allocation more directly.

Let me now turn to a consideration of what areas of study are more useful at this stage. I think a thorough analysis of how decisions are made regarding the use of scarce water would lead to some understanding of the legal, administrative and political framework within which decisions are now being made. Economic analysis could then be useful in suggesting how this framework might be modified and improved.

Some of the more important economic questions which require attention are:

- 1) Should the federal government continue to spend upwards of \$1,000 per acre to develop irrigation projects to increase production when substantial amounts of federal funds are already being used to reduce agricultural production?
- 2) Should high-cost irrigation projects be constructed when inflation control is a serious problem or should this type of activity be postponed until there is a greater need for governmental construction programs to stimulate economic activity?
- 3) What are the costs, benefits and repayment possibilities on a specific project?
- 4) What are the relative costs and returns resulting from the use of scarce water for alternative purposes?

<sup>2</sup> *Resources for Freedom, Volume V, Selected Reports to the Commission, A Report to the President's Materials Policy Commission, June 1952, p. 85-86.*

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- 5) And finally, how are the decisions made to proceed with a particular project and to what extent do the various interests affected by these decisions have an opportunity to present their views. Political economists can make a real contribution by presenting a clear concise statement on the economics of a given project as well as a more thorough analysis of how the various interest groups are represented in the decision-making process.<sup>3</sup>

<sup>3</sup> Ottar Nervik, *et al.* *Economics of Federal Irrigation Projects in the Missouri Basin*, South Dakota State College, Agricultural Experiment Station, Circular 110, June 1954.

## ECONOMIC EVALUATION OF THE SMALL WATERSHED PROGRAM

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**I**N ORDER to limit the scope of our analysis to manageable proportions, we have centered the discussion around the program authorized by Public Law 566 (83rd Congress, 2d Session), as amended by Public Law 1018 (84th Congress, 2d Session), known as the "Watershed Protection and Flood Prevention Act."

The economics of protection of small watersheds and of flood prevention have been discussed many times but primarily in reference to legislative, institutional, or policy aspects of the broad field of water-resource development. This paper is concerned mainly with problems of appraising the economic impacts of watershed projects within the existing legal and organizational environment. The treatment of legislation, policy, and administration is confined largely to provisions affecting economic analysis.

### *Background, Nature, and Requirements of the Small Watershed Program*

#### *Early watershed legislation*

Evolution of federal policy in the field of small watershed protection and flood prevention traces back a half-century.<sup>1</sup> Much of the early legislation dealt with forest management as a means of preventing erosion and retarding runoff. Succeeding laws provided for research in development of measures for retarding erosion and runoff. These efforts were climaxed by congressional establishment of the Soil Conservation Service in 1935 and passage of the 1936 Flood Control Act which authorized the Department of Agriculture to install works of improvement for retardation of runoff and waterflow and prevention of soil erosion.

Between the year 1946 (when installation was commenced) and June 30, 1957, in 11 watersheds comprising about 30 million acres for which projects were authorized under the 1936 Flood Control Act, about \$70 million of federal funds and \$40 million of non-federal funds were expended for works of improvement.<sup>2</sup> Although much has been accomplished in these watersheds, the recommended treatments are by no means completed. Considering over-all needs, the Soil Conservation Service estimates the

<sup>1</sup> Harry A. Steele, "Economics of Small Watershed Protection," *Conference Proceedings*, Committee on Water Resources Development of the Western Agricultural Economics Research Council, Pullman, Wash., June 27-29, 1955.

<sup>2</sup> Soil Conservation Service unpublished records.

cost of the remaining works of improvement required to be about \$558 million.

Appropriation of \$5 million by the Congress in 1953 to initiate a 5-year pilot program for protection of small watersheds was the forerunner of the watershed-protection and flood-prevention program authorized a year later. Congress intended the pilot program (1) to develop ways and means of planning and developing upstream watershed protection by joint co-operation of local, State, and Federal Governments, and (2) to serve as a demonstration of the benefits to be derived. Installation of improvements through joint action of the Soil Conservation Service and local agencies has been started under this authority in 55 watersheds that total about 3 million acres.

#### *Major provisions of Public Law 566*

Under Public Law 566, as amended by the Act of August 7, 1956, requests for initiation of a watershed project must come from local organizations. This provision, which was not included in the 1936 Act, more nearly insures local interest before the federal government undertakes costly surveys and planning of improvement measures.

Public Law 566 authorizes the Secretary of Agriculture to assist local organizations in planning and installing structural and land-treatment measures in watersheds not exceeding 250,000 acres for purposes of (1) flood prevention and (2) conservation, development, utilization, or disposal of water. As a condition to obtaining federal assistance, the watershed work plan must include land-treatment measures needed to reduce serious sedimentation hazards to planned structural measures and to prevent damage from floodwaters. The work plan may include structural measures for flood prevention, irrigation, drainage, or other purposes related to the development and utilization of water resources. Although the goal of planning is to maximize net returns from watershed development for all purposes authorized by the law, the desires of local interests largely control the scope and scale of structural measures recommended. In this regard, it is significant that local agencies are the project developers and the included measures must be acceptable to them.

Within requirements of Public Law 566, the small watershed program is administered by the Soil Conservation Service in conformance with criteria and policy set forth in administrative documents.<sup>a</sup> A local organization must make application and the state must approve before any planning assistance is rendered.

To receive federal assistance in the installation of works of improve-

<sup>a</sup> Soil Conservation Service, U.S. Department of Agriculture, *Interim Watershed Protection Handbook*, as revised October 1, 1956.

ment, local organization must meet additional requirements. Among other things, they must: (1) acquire all necessary lands, easements, and rights-of-way; (2) assume a proportionate share of the costs of installing those works of improvement dealing with the agricultural phases of the conservation, development, utilization, and disposal of water, in consideration of the direct identifiable benefits; (3) assume all of the cost of installing works of improvement chargeable to nonagricultural purposes, except that any part of the construction cost applicable to flood prevention shall be borne by the federal government; (4) arrange for defraying all costs of operating and maintaining works of improvement; (5) acquire, or provide assurance that landowners or water users have acquired, water rights pursuant to state law; and (6) have installed or commenced installation on not less than 75 percent of the effective land-treatment measures on those sediment-source areas that constitute a serious hazard to the satisfactory design, operation, or maintenance of structural works of improvement.\*

Under the policy of the U. S. Department of Agriculture, authority under Public Law 566 is used to provide assistance for installing works of improvement that could not be undertaken readily by individual farmers or small groups of farmers with the help available from other agricultural programs.

#### *Evaluation Status of the Small Watershed Program*

Although sometimes forgotten it should be obvious that present-day economic appraisal of the small watershed program represents prediction rather than accomplishment. Nowhere in this country have complete watershed programs been established for periods long enough to evaluate their influences fully. Thus, we do not yet have adequate evidence from which to forecast effects of watershed proposals. Nevertheless, much progress has been made in developing evaluation principles and procedures.

The legal and administrative mandate for economic analysis of proposed watershed projects is set forth clearly in successive statements of the Congress, the President, the Secretary of Agriculture, and the Administrator of the Soil Conservation Service. Public Law 566, Section 3, directs the Secretary of Agriculture to determine whether benefits exceed costs. In complying with this directive, the President has charged the Secretary of Agriculture with the responsibility of establishing (1) criteria for formulation and justification of plans of improvement and (2) economic standards and objectives, including standards as to degree of flood

\*This provision is required by administrative policy of the Soil Conservation Service.

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protection for works of improvement.<sup>5</sup> The Secretary has had this to say about economic analysis:

"Works of improvement shall be based on sound economic analysis. Costs shall be less than primary benefits. Benefits are to be assessed with care and are to be clearly creditable to the improvement. Secondary and intangible benefits should not be used for economic justification, but may appropriately be used as argument for project justification or proposals for establishing equitable cost-sharing arrangements."<sup>6</sup>

The Soil Conservation Service Administrator in his "Interim Watershed Protection Handbook" adds two general concepts to the purpose of economic analysis: (1) Maximization of net benefits, and (2) selection of the least costly alternative means of meeting project needs.

These principles and criteria were set forth in detail in a report to the Federal Inter-Agency River Basin Committee by the Subcommittee on Benefits and Costs in May 1950.<sup>7</sup> This report also treats with problems of measurement of benefits and cost and proposes methods of application of principles. Another statement of principles and criteria for evaluating water-resource proposals is Budget Circular No. A-47, issued by the Bureau of the Budget in December 1952.

To facilitate the application of the foregoing principles of economic appraisal, the Soil Conservation Service has prepared an Interim Economics Guide for use in planning watershed-protection and flood-prevention projects. In addition to recapitulating principles and basic assumptions, this guide suggests procedures for carrying out specific planning functions requiring economic analysis, including (1) appraisal of flood, sediment, and erosion damages, (2) appraisal of benefits from intensification of flood-plain use, (3) determination of project scale, (4) determination of expected costs and benefits attributed to specific measures, and (5) evaluation of drainage, irrigation, and other benefits that stem from water conservation.

To supplement the National Soil Conservation Economics Guide, economists of the Soil Conservation Service have developed procedures of economic evaluation applicable to local conditions in their respective regions of the country. These guides are based largely on regional planning experience, and they serve to unify procedures for planning watershed projects.

Current evaluation principles, methods of application, and underlying

<sup>5</sup> Executive Order 10584, December 18, 1954, "Prescribing Rules and Regulations Relating to the Administration of the Watershed Protection and Flood Prevention Act."

<sup>6</sup> Policy of the Secretary of Agriculture for the Administration of the Watershed Protection and Flood Prevention Act, September 17, 1956.

<sup>7</sup> "Proposed Practices for Economic Analysis of River Basin Projects."



assumptions should be regarded as planning tools. Results of their application have not yet been tested or verified by observation and analysis of watershed projects. Perhaps we should now concentrate less on developing planning tools and more on determining whether those we already have are appropriate. As a means toward this end, observation and analysis of the effects of installed measures should be helpful. To be most useful, from the start this kind of study should observe the functioning of watershed measures under actual conditions.

### *Studies of installed projects presently underway*

Projects of the pilot program presently serve as laboratories for observing physical and economic effects of works of improvement and also provide an empirical basis for studying the organizational and financial management aspects of the watershed program. Installation of needed improvements is more than 90 percent completed in 20 of the 55 pilot projects. Most of these plans were initially set up for a 5-year period of installation but operations did not get underway until late in 1954 or early 1955. Establishment of proposed watershed improvements in terms of their estimated cost is approximately 57 percent completed.

In keeping with the intent of the Congress, the Soil Conservation Service, in cooperation with other departmental, federal and state agencies is carrying on surveys in the pilot watersheds to determine the effectiveness of installed measures under actual storm and watershed conditions. The broad objectives of these surveys as defined by the Soil Conservation Service are to determine the effects of the project (1) on reducing erosion, sedimentation, and runoff and the resultant benefits to farmers and other interests; and (2) on the economy of the watershed. Funds available to the Department of Agriculture for these investigations are not sufficient to carry on the necessary detailed measurements in all 55 pilot watersheds. Therefore, detailed surveys are being made in only 7 project areas while in the others collection of data is more limited.

Gages for measuring precipitation, streamflow, and stage have been installed in the study areas. Gages and other facilities have also been installed to measure rates of sedimentation. With these measurements available, the effect of installed measures on runoff and sedimentation during specific storms can be estimated by experienced hydrologists.

Economic analyses in the pilot watersheds subject to intensive survey consider (1) units of ownership and operation; (2) preproject general land use, income, and management data on all watershed farms; (3) preproject use, management, and productivity of flood-plain fields and of sample upland fields; (4) annual changes in use, management, production, and

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income of flood-plain fields and of sample upland fields; (5) flood damages from specific storm events to land, crops, and fixed improvements; (6) use and management of land and water in reservoir areas; and (7) cost of installing, operating, and maintaining watershed measures and practices.

Observation and analysis of the effects of installed measures in pilot watersheds have been underway for only 2 or 3 years. Results to date are therefore fragmentary. An interim progress report of evaluation of Six Mile Creek (a pilot project in Arkansas) sets forth a detailed account of the plan of evaluation, including the activities listed above.<sup>8</sup> The program thus far completed in Six Mile Creek has produced significant reduction in flood damages. Water retained in the space provided for sediment in floodwater-retarding structures has been the source of benefits from irrigation, municipal water, and recreation. Investigations in this watershed and others in which similar evaluation studies are underway indicate that observing and analyzing changes in use, management, and production of land and water will provide data for the improvement of current economic evaluation criteria and procedures used in watershed planning.

Other instances of evaluation of the effects of watershed improvements include special reports of recent storms occurring in pilot watersheds.<sup>9</sup> These studies made by the Soil Conservation Service show reductions in peak streamflows and flood damages afforded by watershed measures and have served to improve hydrologic and engineering evaluations. The Soil Conservation Service is also investigating the operation of structural measures during the 1957 flood in Texas, Oklahoma, and Arkansas. This study is aimed primarily at determining changes in criteria, procedures, or practices that may be needed for improvement in planning, design, construction, evaluation, and operation and maintenance of Public Law 566 projects.

An evaluation of improvements installed for small watershed protection is being conducted by the Tennessee Valley Authority and the University of North Carolina in the 1,000-acre Parker Branch Watershed in Buncombe County, N.C. Reports of this study indicate that the first 2 years were a "calibration" period, during which time data were collected concerning water behavior, farm credit, farm resources, land capability, and farm family skills.<sup>10</sup> Following the calibration period, farm operators were given technical and material assistance to develop farming systems aimed

<sup>8</sup> "Watershed Program Evaluation," Six Mile Creek, Arkansas, Interim Progress Report, Agricultural Research Service, Soil Conservation Service, United States Department of Agriculture, July 1957.

<sup>9</sup> Soil Conservation Service, unpublished reports.

<sup>10</sup> Tennessee Valley Authority, Division of Agricultural Relations, Annual Report, July 1, 1955-June 30, 1956.

at achievement of the highest sustained net farm income in view of each farmer's production resources. Final appraisal of hydrological and economic changes is scheduled for the period 1957 to 1962.

### *Expansion of Evaluation Studies*

Continuation of evaluation studies on the present scale is not sufficient to meet our future need for economic appraisal of the small watershed program. Programs for conservation and development of natural resources have tremendous popular appeal. The small watershed program is growing rapidly, and to provide sound guidance, it will be necessary to know the facts about its economic impacts.

As evidence of the program's popularity, 731 applications for federal assistance have been received since passage of Public Law 566 3 years ago. Of these applications, 268 have been approved by the Soil Conservation Service for planning assistance. Works of improvement have been started in 44 of these watersheds which encompass more than 2 million acres. Final work plans have been completed for 23 additional watersheds and tentative work plans for 26 others.

Intensive economic study of a sufficient number of these watersheds to represent different problem situations would provide the means to make a more effective appraisal of the influences of watershed development. Economists who work closely with physical scientists should record and analyze the management, use, and production of watershed resources in relation to the works of improvement. Direct aims of this research should include (1) determination of the rate and timing of installing and adopting measures and practices; (2) analysis of factors associated with progress or lack of progress in installation; (3) appraisal of project impacts, both primary and secondary; (4) determination, so far as possible, of the beneficiaries and cost bearers; (5) analysis of financing methods employed; (6) study of organizational arrangements; and (7) appraisal of water problems not solved by project measures.

This kind of research is not expected to provide a complete measurement of the regional or national impacts or of the potential magnitude of the watershed protection program. However, in this regard it will be useful in furnishing input-output relations that may be transferred. Undoubtedly, national and regional requirements for the kinds of goods and services provided through development of watershed resources will have an important bearing on the economic feasibility of widespread application of watershed projects. A fruitful approach to this problem may involve study of the economic advantages of resource utilization in areas subject to improvement by watershed programs in contrast to resource management and improvement in competitive areas.

*Important Factors in Economic Appraisal of the Small Watershed Program*

Recognition of the nature and purpose of project measures in specific watersheds is a fundamental consideration in appraising their value to watershed residents and to the nation as a whole. Review of the 150 watershed work plans prepared to date under Public Law 566 and the pilot program indicates that the majority of the projects are designed primarily to reduce agricultural flood damages and to restore former land productivity. Protection of residential, industrial, commercial, and transportation facilities is also an important function of many projects. In a few instances, it is the predominant purpose. In other watersheds, improved drainage alone or in combination with flood protection is the motive for works of improvement.

Generally no project is approved for installation under Public Law 566 unless it contains both structural and needed land-treatment measures.

Structural measures are designed to fulfill such specific functions as reduction of damages, water supply, or drainage; and as such they are applicable to only a small percentage of the nation's land resources. Land-treatment measures included in Public Law 566 projects are generally limited only to those that have a measurable effect on flood prevention, or are needed to protect structural works of improvement from sedimentation. Their major effects, however, are in connection with the use and production of land on which they are situated; and they are applicable to a large area of the nation's land resources. The quantity and kind of land-treatment measures to be installed under the watershed program and their impacts are thus affected by economic factors throughout the regional and national economy. Full appraisal of the accomplishment of the small watershed program in this respect must consider economic factors in addition to those obtained through the approach suggested earlier in this paper.

Administrative direction of the program requires that land-treatment measures included in project work plans be limited to those that may be achieved during the project installation period (typically 5 years). Present use of Public Law 566 funds for installing land-treatment measures for watershed protection on non-federal land has been confined in the main to accelerating technical assistance only. Exception to this practice is made for economically justifiable land-treatment measures installed primarily for flood prevention. In view of these policies, the small watershed program consists generally of structural developments for water control and management to supplement existing soil and water conservation and development programs of federal and state agencies. Economic appraisal of the watershed program becomes less formidable in this light.



### *Effects of land-treatment measures*

Basically different approaches are required in measuring the twofold influence of land-treatment measures included in watershed projects. Economic effects of land-treatment on reduction of flood and sediment damage are based on hydrologic measurement and are confined to downstream, off-site locations. Measurement of the on-site influence of land-treatment requires a study of changes that occur in the field or fields on which the land-treatment practices are located. Conservation economists often ignore this by placing more confidence than is warranted in studies of the farm as a whole. In following the "farm approach" of evaluation the analyst should be aware of the direct effects of the individual practices and of the inter-related practices with which the conservationist is concerned. Ex post evaluation offers the opportunity to obtain these basic data referenced to farm field situations which vary in their conservation requirements. With these data available, more reliance may be placed on results obtained by both statistical techniques and budgeting.

### *Reduction of flood damages*

Evaluation of the effects of installed watershed measures on reduction of damages requires an approach that is the reverse of the planning technique. In planning, the economist estimates for a given storm (actual or synthetic) the reduction in damages that would be afforded by the corrective measures contemplated. Two types of projections are needed: (1) expectations with installed measures and (2) expectations without. After a project is installed, the economist estimates for a given storm how much greater the damage would have been if no corrective measure had been installed. Here the damages with the program can be measured, but those without must be hypothetical. Thus some type of extrapolation or projection is necessary in both instances. In the latter possibilities for more reliable estimates are greater for several reasons: (1) Current storms are studied; (2) adequate gaged records of precipitation and streamflow are available; (3) actual storage and release measurements of dams are known; and (4) actual values of property that would have suffered damage are known.

In order to attribute benefits from reduction in inundation to remedial measures, appraisals of actual and predicted damages must be related to flood characteristics such as depth of flooding, stage of stream, and discharge. Appraisals of damage should take account of production costs, yields, and returns in the flooded area in contrast to those that prevail in similar flood-free fields. If land is damaged by scour and deposition, costs of sediment removal and farm operations that would be unnecessary

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otherwise should be recorded. Rates of recovery of productivity should also be noted from year to year. Use of these data to support appropriate analyses would serve to improve damage-evaluation factors used for planning other watershed-improvement projects.

On bottom lands where flooding is frequent or where land has been damaged severely by scour or deposition, intensification of land use after provision of flood protection may be due partially or wholly to the effects of flood protection. Circumstances surrounding these changes and checks against uncontrolled areas should be used to compute project benefits and also to verify or revise planning procedures.

Basic information is needed to develop adequate procedures for evaluating the effect of sedimentation on services provided by farm ponds and lakes. Observation and study of the limitations of use imposed by sedimentation will provide much of the data required.

Appraisal of reduction of flood damage to other types of property such as farm improvements, urban developments, and transportation facilities will provide information for improving current appraisal techniques.

#### *Land stabilization*

Evaluation of measures for stabilizing gullies and waterways has presented some difficult economic problems in project formulation. When the protection of buildings or roads is involved or when serious sedimentation damages are produced, economic feasibility of control measures is usually demonstrable. However, when protection of agricultural lands is the major purpose of stabilization, determination of economic feasibility poses many problems of measurement. We need to observe farmers' decisions in both stabilized and unstabilized situations. The use of postulated functional relationships between structural measures and land-treatment measures frequently result in forecasts of substantial benefits from land treatments made possible by gully control. Attention needs to be given the development of economic procedures that are based on analysis of measurable changes attributed to installed corrective works.

It is possible that under certain conditions measures for gully control may not be justified in terms of monetary or tangible benefits. Administrators may decide, however, that other benefits are sufficient to justify their installation. The Secretary of Agriculture recognized this fact in his instructions concerning the national inventory of soil and water conservation needs currently underway when he said:

"Certain conservation measures that present serious, permanent loss to soil and water resources may be so much in the public interest as to justify expendi-

tures in an area in excess of returns to land owners and operators, and even to the Nation in the foreseeable future."<sup>11</sup>

The problem of establishing additional criteria to guide investment in such measures under the viewpoint indicated is obvious.

### *Water supply*

Few Public Law 566 projects to date have included water supply as one of their direct purposes. Current evaluation surveys have demonstrated that owners of land adjacent to floodwater-retarding structures have obtained significant values from use of water retained by storage space that is reserved for deposition. These benefits include stockwater, irrigation, municipal water, and recreation. Further record and evaluation of such services in other watersheds will furnish useful data for watershed planning. For example, experience has shown that quite frequently landowners are slow to grant easements and rights-of-way for establishment of water storage structures. Making them aware of potential on-site benefits should help to ease this problem of operation.

In connection with the use of sediment-pool storage for beneficial purposes, it will be interesting to observe changes in such use as storage becomes depleted by deposition. Use of these services for several years may create local interest in planning water-supply features as a part of future projects.

Although the Congress intended the watershed program to consider and treat all beneficial uses of water, local interests in general have been reluctant to incorporate water supply in project plans. This fact may be due to legislative cost-sharing arrangements that encourage allocation of installation expenditures to flood control.<sup>12</sup> Lack of recognition of potential benefits by local interests has also been an important contributing factor. In order to reveal these omissions, studies of installed projects should examine and appraise the need for those water-management and control functions not provided.

If need exists for additional water supply, analysis should indicate whether this storage might have been included economically in the project. The cost of meeting these additional water requirements by modification of the installed improvements should be compared with the cost had the purpose been met by the watershed project. This situation poses a problem to watershed planners in considering future water needs when local interests are not able or willing to give financial support to the required investment for water supply.

Methods of appraising recreation values provided by water-resource

<sup>11</sup> Secretary of Agriculture's Memorandum 1396.

<sup>12</sup> See Requirement Number 3, under Major Provisions of Public Law 566.

projects are in a formative stage. There is no doubt that establishment of economic principles and assumptions is needed to improve these methods, but it is equally certain that evaluation methods must be adapted to the quantity and kind of physical uses made of water-resource development. In this regard, evaluation of specific watershed improvements should record such uses as the kind and quantity of fish and game taken, the amount of swimming, boating, and visiting, cottage developments, and other associated forms of recreation. Additional data collected for evaluation purposes might include fees charged by land-owners and costs of associated nonproject facilities.

### *Secondary project effects*

There is general agreement among economists that net secondary effects of water-resource projects are justifiable credits. From a national viewpoint, the net value of secondary benefits after considering associated costs and alternative use of resources is regarded as relatively unimportant. On the basis of local impacts, however, secondary project effects may have considerable influence in developing local interest in watershed projects. Appraisal of such effects may serve to guide the revision of cost-sharing arrangements that permit the federal government to bear a proportionate share of the costs of installing measures for agricultural drainage and water supply in consideration of the secondary benefits.

### *Operation of measures with respect to scale*

Much has been written with respect to maximization of net benefits in planning water-resource developments. Analyses of the operation of installed watershed measures during given flood-producing storms will provide a means of testing the extent to which this concept has been applied in project formulation. Studies of this kind should also indicate possible limitations in application of the principle imposed by characteristics of the water problems encountered.

### *Comparative functioning of flood-prevention measures*

Work plans for flood prevention frequently recommend both flood-water-retarding structures and channel improvement to alleviate flood hazards in the same flood zones. Effectiveness of the measures functioning as a unit during given flood events can be determined. Hydrologic and economic analyses to determine potential damage reduction of each measure operating alone is needed to provide the research data essential for more adequate planning.

Analysis of the comparative effectiveness of land-treatment measures and structural measures toward reduction of damaging streamflows and

their interrelated effects will also furnish needed research data for improving planning methods.

*The Future Role of Economic Evaluation in the  
Small Watershed Program*

Research founded on accomplishments of existing watershed developments, in conjunction with investigations to determine additional water needs can be a significant influence in guiding federal, state, and local efforts in the small watershed program. Toward this end, the authors have suggested ideas concerning the kinds of research needed and the specific purposes served thereby. The potential magnitude of the watershed program, its popular appeal, and the expressed financial interest of the federal government warrant adequate appraisal of all pertinent facts obtainable.

**DISCUSSION: ECONOMIC EVALUATION OF THE SMALL  
WATERSHED PROGRAM**

E. L. BAUM\*

*Tennessee Valley Authority*

Agricultural economists in recent years have become increasingly interested in watershed research problems, especially since the passage of Public Law 566 in 1954. Since watersheds are an important basis for research in TVA, we welcome this opportunity to participate in a discussion of watershed programs, objectives, problems, and research methodology. Such discussion should enable us to make the greatest improvements in economic evaluation of watershed programs. We, as agricultural economists, can aid in developing a sound basis for public policy recommendations and expenditures on watershed improvement by improving our analytical tools and developing a sound conceptual framework for economic research for this unique sector.

The authors have limited their paper primarily to a discussion of the problems of appraising the economic impacts of watershed projects within the existing legal and organizational environment. They have clearly set forth both the general legislative and executive goals and objectives for watershed research and have assumed that current evaluation principles, methods of application, and underlying assumptions of watershed research are adequate and should be regarded as planning tools. Having done this, they proceeded to conclude that economists should now concentrate less on developing planning tools and more

\* Appreciation is extended to my associates in the Agricultural Economics Branch, TVA, who made valuable suggestions in the development of this discussion paper.



on studying whether those we already have are appropriate. It is logical, therefore, that Weinberger and Otte directed their paper toward an evaluation of watershed projects, rather than an economic evaluation of the small watershed program.

The authors are to be commended for their treatment of this very timely subject and for setting forth some of the major factors to be considered in watershed project evaluation. However, I should like to caution them not to be too hasty in ruling out the need for further consideration of evaluation principles, research methodology, and assumed objectives of watershed improvement programs. Perhaps, some of the present difficulties in maintaining local support in some watershed projects result from a generalized approach to specific and different watershed problems. Alternative approaches to solutions of watershed problems and the attainment of watershed program objectives should not be ruled out. While emphasis on structural and land-treatment measures designed to reduce flood damages, water runoff, and sedimentation would be appropriate for some watershed programs, such emphasis may not be appropriate for other watersheds. For example, where major emphasis is placed on structural and land-treatment measures for long-run maximization of on-site (as well as off-site) benefits from flood damages and water runoff, short-run reduction of on-site farm income might be sufficient to reduce local participation. This would be especially true for watersheds consisting primarily of low-income and part-time farmers, who generally do not possess sufficient quantities of capital to undertake land-treatment measures which require several years before income benefits can be obtained. An alternative approach for such watersheds might be one that placed less emphasis on structural measures and more on land-use changes that would consider short- and long-run income benefits but still accomplish watershed program objectives.

In view of a possible conflict in objectives between individuals within and beyond a watershed, (1) the ends or goals of proposed watershed research and programs should be firmly established, and (2) the conceptual models of a watershed, both in terms of the relationships within the watershed, and the relationships of the watershed sector to other parts of the economy, should be firmly outlined before economic research and program evaluation are undertaken.

Watershed research should be limited to specific and unique watershed problems. Generally, this implies that research should revolve around and arise from problems relating to water, streamflow, and management. Watershed problems are unique and exist mainly, or only, because of their economic or social entities. Different physical entities also exist, but there would be no social problems if they were not also different economic entities. The entities include (1) farm families and others in



the area, and (2) off-site groups which gain from flood and sedimentation control, or power, transportation, and recreation development. Because of these different entities, three types of problems arise:

- (1) The ends—objectives or products which represent benefits—of the two entities are competitive; one can be furthered only at sacrifice in the other. In some cases, for example, water management to control flooding might require farming systems which give lower profits than preproject farming organizations. Hence, farmers will not use soil management schemes which aid flood control or provide a waterflow most consistent with transportation, power, or industry. Likewise, use of water for irrigation may conflict with use for human, or other nonagricultural purposes, and vice versa.
- (2) The ends or objectives are complementary or supplementary but knowledge and information are lacking. The water management method which prevents flooding and provides benefits to off-site persons and locations may be one which also retains water on the land and allows higher yields and farm incomes. Similarly, if large costs are involved on farmland while the benefits are largely off-site, as in flood control, interest will be competitive. Thus a divergence between costs and benefits causes competition in ends for the two economic sectors. Therefore, need exists for developing an equitable basis for cost sharing by the off-site entity.
- (3) The ends are complementary and the relevant knowledge is possessed by the two entities, but institutional and legal means do not allow the gains to be aggregated and a water management program to be initiated.

Thus, objective research is needed to determine the extent, conditions, and approaches to which watershed action is competitive or complementary under conditions of full knowledge and lack of knowledge.

The point of this discussion which I would like to reemphasize is that Weinberger and Otte have done an excellent job of presenting a research approach to an economic evaluation of watershed projects but they have not strongly emphasized the need for considering alternative approaches and research methodologies to watershed research and program evaluation.

Local participation in watershed improvement programs is very essential to the success of any watershed program. In evaluating watershed programs, care should be taken to determine the reasons for local participation, or the lack of it, and relate these factors to the programs' goals, objectives, and procedures. Such a procedure would throw light upon the need for program modifications and improvements to conform more closely with individual watershed problems. Logically, this implies that there is a real need for continued consideration of alternative approaches to watershed improvement programs. With comparative data for alternative watershed development programs made available through research, much of the basis for appraising the effectiveness of alternative types of watersheds should be forthcoming.

## COOPERATIVES IN A CHANGING AGRICULTURE

Chairman: Kenneth Stern, American Institute of Cooperatives

### THE ROLE OF COOPERATIVES IN BARGAINING

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*University of Wisconsin*

**T**ODAY'S topic of cooperatives in a changing agriculture might well be broadened to be cooperatives in a changing economy. Not only must cooperatives adapt to agriculture, but for their own survival they must adapt to the basic structural changes in market organization outside the farm. My remarks will be directed today to the role of agricultural cooperatives in this broader area.

#### *Types of Bargaining*

Any discussion of cooperatives in bargaining requires specification of some terms. "Bargaining" has taken on at least three different meanings. One refers to bilateral competition or the market power relationships establishing the terms of exchange between buyer and seller. Special cases of this kind of competition are designated as bilateral monopoly or bilateral oligopoly. A general term growing in usage to designate bilateral competition is "countervailing power," and an earlier term used mostly by institutional economists was simply "bargaining power." This might be called Type I bargaining.

A less commonly accepted concept of bargaining refers to interfirm competition or to the market power relationships existing between buyer and buyer or between seller and seller, which establish the term of behavior among rivals and realized market results. The special cases of this type carry familiar designations such as pure competition, monopolistic competition, pure and differentiated oligopoly, single firm monopoly, and their counterparts on the buying side. This might be called Type II bargaining.

Bargaining may also be applied in the political economy to the efforts of any group to use its power to influence an outcome where government is one of the participants. Lobbying activity by a pressure group to secure particular legislation would be an example. Or once the legislation becomes law, the appearance of organized groups in hearings to persuade administrative officials to make certain findings and determinations would be a form of bargaining. This might be called Type III bargaining.

Bargaining therefore means establishing market power in any of the three senses used above. Bargaining is limited to imperfect markets because the individual in purely competitive markets has no power.

Market power means control both in the selection and in the magnitudes of the variables affecting the outcome which the individual or group is seeking to manipulate. This might be a price or a quantity or short-run net money returns; other outcomes might be services at cost, long-run profit, stability, growth, security, or the like. Perhaps the *ne plus ultra* of bargaining power would be an organization conforming to the monopoly-monopsony model, producing a product with no substitutes, and able to deliver enough votes to swing any election.

Farmer cooperatives are found in all three types of bargaining categories attempting to enhance their market power. They countervail the forces of firms who buy from them or sell to them. Cooperative associations compete with one another and with noncooperative enterprises in buying and in selling. Also cooperatives conduct lobbying activities in their individual or collective interests.

Ideally, a person attempting to specify the role of cooperatives in bargaining should analyze the experience and behavior of farmer cooperatives in each of the three categories above. This, of course, assumes that cooperatives are tools or instruments for achieving particular goals rather than being ends in themselves. Another approach would be to establish by assumption, deduction, or proclamation what the role of cooperatives ought to be in bargaining.

Unhappily, the literature on cooperatives, while voluminous, devotes little space to research on the economics of cooperatives' problems as contrasted with philosophical, educational, membership, personnel, management, legal, and other problems. My impression is that most of what passes for research in the economics of cooperatives is theoretical model building at best or restatements of faith at worst.<sup>1</sup>

The literature on cooperatives contains no explicit recognition that Type III bargaining is a subject for research. Published research on the behavioral results of cooperatives in Type II bargaining also seems hard to obtain although considerable space is devoted to statements that cooperatives should be "pace-setters" and competitive "yardsticks." With respect to the Type I bargaining activities of cooperatives some studies have been made of individual associations, but most of the published writings are in the form of narrative reports rather than economic analysis.<sup>2</sup>

<sup>1</sup> The work of Clark, Hirsch, Phillips, and Aresvik comes to mind in the first case.

<sup>2</sup> For examples see W. J. Klotzbach, "How We Organized for Bargaining—A Group Considering a Bargaining Cooperative," *Proceedings of the Conference on Fruit and Vegetable Bargaining Cooperatives*, USDA, FCS, January 1957; Kelsey B. Gardner and A. W. McKay, *The California Fruit Growers Exchange System*, USDA, FCA Circular C-135, May 1950; and A. W. Chambers, "Problems and Accomplishments of the Utah State Canning Crops Association," *American Cooperation*, Washington: American Institute of Cooperation, 1951.

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Since there does not seem to be an adequate volume of research on the economic behavior of cooperatives, the role of cooperatives in bargaining is not known as a matter of fact and experience. Also it is not possible to deduce by any method known to me what the role of cooperatives should be in economic affairs despite the many efforts in this direction. The burden of this paper will be to examine the theoretical contributions from economics as a discipline that might be useful in conducting a research inquiry into the role of cooperatives in bargaining. No model will be presented as an exact miniature replica of what cooperatives are or should be or based on principles, rather some ideas will be presented that might be used to guide research into what cooperatives are or could be or should be.

### *Bargaining Cooperatives in Bilateral Competition*

One of the starting points is bilateral monopoly. The most recent version concludes that output tends to the amount that would maximize the joint profit of the buyer and seller with price being indeterminate within limits. These limits are set by the seller's average cost as the zero-profit-to-the-seller lower limit of price, and by the buyer's average revenue product as the zero-profit-to-the-buyer upper limit of price.<sup>3</sup>

This model is suggestive of certain lines of inquiry in situations in agriculture where a single selling cooperative might face a single buyer. One of these is an investigation of the limits of price. A determination of the average revenue product of the buyer determines how much he can afford to pay. Knowledge of the costs of production indicates the minimum that the seller can afford to accept and break even.

Another important factor in the model is recognition that output is under control. Not only is output under control, but there are no close substitutes for the product. Buyer and seller really need one another. If they fail to arrive at some kind of agreement within the specified range there will be a loss for both of them.

The model is static and does not recognize that the particular price outcome of one year might be serially related to past and future results. The structural aspects of the market are given when in fact considerable effort might be required to maintain the form of bilateral monopoly. Finally it assumes maximizing behavior with respect to a single variable—profit. This cautions the researcher to determine what, if anything, is being maximized by the units under investigation. Price and profit may be incidental to other factors or to the total utilities involved in such a transaction.

<sup>3</sup> William Fellner, "Prices and Wages Under Bilateral Monopoly," *Quarterly Journal of Economics*, August 1939.



Another theoretical model is one suggestive for the wage fixing activities of unions.<sup>4</sup> The equilibrium wage rate under conditions of monopsony and assumptions of maximizing behavior is equal to the marginal value

product of the factor divided by  $(1 + \frac{1}{e})$  where  $e$  is the elasticity of

supply of the factor. To combat the market power of the monopsonist labor can organize into a union and control supply. The supply of the factor is infinitely elastic up to the limit of the total membership of the union.

The assumptions underlying this model are similar to those of the previous one with respect to static conditions and maximizing behavior. But it provides an opportunity for broadening the scope of behavior. One role the union might follow is that of trying to secure the highest wage possible. An alternative might be to maximize the total wage bill to the union, and a third could be to maximize the employment of the members of the union. Under only the most fortuitous circumstances would employment maximize the wage bill and also be equal to the total volume of employment available from the union.

Certain implications for bargaining by cooperative associations seem to follow. No matter what role they conceive for themselves, they must know the derived demand for their product because this will determine the alternative prices the buyer will pay for various quantities. If cooperatives wish to pursue a role of obtaining the highest possible price, they will sell the smallest volume of product. If they wish to maximize the total payment for their product, they may not sell the total output. As in the previous case, they will have to find some way of rationing the burden of the unemployed resources or unsold products among the members of the group. If the group chooses a role of selling the entire volume of their production, the price to be bargained for would be that based on the derived demand for their product. A simple, but important observation is that both price and output cannot be determined independently if price is to move the available supply into consumption. This model is broad enough to include maximum price, maximum returns to producers, or maximum output handled. It does not provide any insights or guides to the role of a cooperative with respect to nonprice or fringe considerations of all kinds.

What some bargaining associations see as their economic role may be inferred from the statements of cooperative managers. As yet no research has established whether these functions are being realized. To achieve

<sup>4</sup> Martin Bronfenbrenner, "The Economics of Collective Bargaining," *Quarterly of Economics*, August 1947.

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price stability was listed as a prime function of the Washington Canning Pear Association, according to the manager while he viewed with alarm the fact that every year the grower is confronted with fewer and fewer buyers.<sup>5</sup> Another role assigned to bargaining associations is "to accomplish for its members, or for the commodity, the highest price that is justified by economic conditions." Perhaps the most often expressed opinion of the role of such an association is to give farmers a "voice" in establishing the price and terms of sale for their product.

Since price negotiation appears to be a primary function of bargaining associations, two price concepts need mentioning. California law permits canner contracts to be written which provide that the price of the produce should be a "reasonable price." Presumably, what was "reasonable" could be determined by the court if the growers and canners did not reach agreement.<sup>6</sup> The "economic price" for a bargaining association "may be viewed as that per unit return which moves the available supply into consumption, with corresponding adjustments of pipe-line inventories adequate to maintain year-round flow of supplies to consumers."<sup>7</sup> Unfortunately neither of these concepts tells us much about what the cooperative is after. The available supply that makes the price reasonable and economic in the case of fruit may be the natural supply on tree, or what is left on tree after a 20 percent green fruit drop, or what can be marketed as a result of some other supply restriction device operating under an agreement and/or order.<sup>8</sup>

In short, the present evidence is not very enlightening on the role of bargaining associations, but the suspicion is great that the related theories of monopoly-monopsony might provide a useful framework for analysis.

### *Cooperatives in Interfirm Competition*

To increase their bargaining strength or market power, historically farmers have organized cooperatives to handle and process their commodities in direct competition with other firms. This has been true especially where the number of agencies in the market was few, and the cooperative hoped to be a major factor in the market.

<sup>5</sup> Berkely I. Freeman, "The First Anniversary of the Pear Bargaining Association," *Proceedings, Fiftieth Annual Meeting, Washington State Horticultural Assoc.*, 1955. The number of pear canners decreased from 15 in 1946 to 8 by 1954.

<sup>6</sup> Ralph B. Bunje, "Bargaining Cooperatives—Their Problems and Operations," speech at 28th Annual Meeting, National Council of Farmer Cooperatives, 1957.

<sup>7</sup> S. S. Hoos, "Economic-Marketing Information—Need and Use in Cooperative Bargaining," *Proceedings of the Conference on Fruit and Vegetable Bargaining Cooperatives*, USDA, FCS, January 1957.

<sup>8</sup> An Associated Press story appearing in the July 21, 1957 issue of *The Milwaukee Journal* reported that California cling peach processors are diverting 37,800 tons of fruit this year to prevent depressed prices. Earlier a 16% green fruit drop had been executed.

The elementary theory of monopoly is certainly indicated as a starting point for any investigation into the role of cooperatives in marketing. However, like bilateral monopoly its assumptions are rigorous and limiting. Short-run profit maximization, control over supply, and remote substitutes are not the overt characteristics of any substantial part of agriculture. However, a cartel model of monopoly with its supply regulation and its proration of output among individual producers might be very useful in analyzing the role of cooperatives in the several marketing agreement and order programs for fruits and vegetables.

Strategic to the maintenance of monopoly power in the theory of monopoly is restricted entry. Remoteness of substitutes is not enough to ensure a monopoly gain if every producer who may want to is allowed to get into the act and destroy any effective control over supply. This suggests one of the dilemmas many marketing cooperatives face. For example, because of a large volume of the product being handled, the cooperative may exercise some monopolistic control. This creates a problem of not encouraging a supply response among existing producers assuming the control device is effective in increasing returns. However, if a marketing cooperative adheres to the principle of "open membership," it has assured the loss of effectiveness of whatever redistribution effect producers were trying to achieve. Open membership appears as an obstacle to monopoly gain except in the case of a supply cooperative where increasing the number of buyer-owners by an open membership policy is a device for increasing volume of sales.

The formal theory of oligopoly in a rigorous form becomes somewhat sterile as an attempt to exhaust the possible consequences of all the possible assumptions and the study of oligopoly has taken on a distinct institutional and empirical form. Research is undertaken on the price, production, and related policies and behavior of firms and industries. From these studies generalizations are drawn about the behavior one would expect to find in markets characterized by few sellers. Rigid prices, non-aggressive pricing, price leadership, live and let live, related price or hidden price competition, product differentiation, nonprice competition, market sharing, workable competition, and the like are all theoretical ideas useful in analyzing the role of industrial corporations.

Many farmer cooperatives are in markets with few sellers or few buyers. Is the economic role of cooperatives similar to competing corporations? Some suggestions for answering these questions come from research done at Wisconsin where, of eight firms handling 50 percent of the milk in the market, four were cooperatively organized.<sup>9</sup> As measured by price

<sup>9</sup> Robert L. Clodius, Darrell F. Fienup, and R. Larry Kristjanson, *Procurement Policies and Practices of a Selected Group of Dairy Processing Firms*, Part 1. Some Aspects

and nonprice behavior, there were no practical differences among cooperatives and noncooperative corporations. Such sophisticated, gentlemanly competition is to be expected among the giants in a market in mature oligopoly or oligopsony. The important thing for farmer producers is that they be represented.

This suggests that cooperatives have a role in creating workable competition in a particular market. Competitive pressure from cooperatives could force all firms to administer prices and services reasonably in line with costs and returns. If prices are administered at levels of excess profits for corporations and if cooperatives follow these price policies, the "overages" will be returned to patrons as dividends. Competition will be effective to the extent that farmers shift from a noncooperative to a cooperative plant.

The role that cooperatives play in maintaining workable competition and the bargaining power of farmers depends on cooperatives of adequate power being physically present. This further suggests survival as an important role for cooperatives, especially in a changing economy. Students working in the economics of industrial structure and organization have indicated what some of these changes are.<sup>10</sup> In 1955 National Dairy Products and Borden had sales of \$2,070,000,000, which were about 60 percent greater than the total net sales of some 1,600 local and regional dairy cooperatives. Such growth is primarily by merger and up to 1948 more than 60 percent of this growth is explained by some 700 mergers. Another example of growth in dairy is Foremost. From sales of \$13 million in 1945, Foremost had grown to sales of \$388 million by 1955, after about 100 mergers. These changes in economic organization and concentration are also spectacular outside of dairy. In the seven years between 1947 and 1954 the share of total output produced by the country's 50 largest manufacturing companies increased from 17 percent to 23 percent.

Whatever the role of cooperatives apparently their function must increasingly be carried out within a context of oligopoly and giant firms. To compete effectively, cooperatives must grow both in efficiency and in size. Enough has been written on both the theory and research results regarding efficiency to indicate that here is a useful area of inquiry. Attention has also been given to size of plant as related to economies of scale and internal growth. External growth as a factor related to survival

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of Market Structure, Competitive Behavior, and Market Results, Wis. Agr. Expt. Sta. Research Bul. 193, January 1956, and Part 2. Managerial Aspects of Price and Nonprice Competitive Behavior Among Nine Dairy Processing Firms, Wis. Agr. Expt. Sta. Research Bul. 199, February 1957.

<sup>10</sup> Willard F. Mueller, in a paper presented to the Summer Directors' Conference, Wisconsin Council of Agriculture Cooperative, Stevens Point, Wis. July 24, 1957.

and market power, and as a tool to assist business enterprises in fulfilling their roles, has achieved less attention. Again the empirical-theoretical work in industrial organization and market structure seems most useful. Success or failure of cooperatives to grow externally through mergers can be a deciding factor in determining whether cooperatives will be around to play their parts in this changing economy.

Failure of cooperatives to grow and achieve their destinies may be explained by contrasting the organization of the decision-making process in large noncooperative corporations with that of cooperatives. In the large corporation, the separation of ownership and control has been well documented.<sup>11</sup>

On the other hand in many cooperatives managerial control is still pretty closely tied to the owner-patrons. Farmer cooperative members are apt to be singularly minded with respect to a particular commodity and a local geographical area. When this is tied with the one-man-one-vote "principle" of cooperation, it suggests a small scope of operation in most instances—certainly as compared with the operations of many non-cooperative corporations. If a study of the growth of cooperatives were undertaken as part of an inquiry into their economic role, it would be interesting to test the hypothesis that growth is related to the structure of managerial control in cooperatives even as it is in corporations.

### *Cooperatives in Political-Economic Bargaining*

With respect to Type III bargaining there seems to be little theory in the field of economics useful in analyzing cooperatives' role. Some work has been done in attempting to analyze the strategies and tactics of opponents in such cases, as well as in Type I bargaining.<sup>12</sup> This assumes that the operational unit knows what it is after. For cooperatives it would appear most fruitful to begin with empirical studies of their activities. By this time there must be hundreds of records of hearings before Congressional committees, in federal milk order markets, in fruit and vegetable marketing orders and agreements, and in petitions to the Secretary of Agriculture which could be analyzed to establish what cooperatives see as their function in a pressure-group society. That this might prove fascinating is indicated by Wesley McCune's *Who's Behind*

<sup>11</sup> The pioneer work is A. A. Berle and G. C. Means, *The Modern Corporation and Private Property*, New York: The Macmillan Co., re-issue, 1948. A later reference is R. A. Gordon, *Business Leadership in the Large Corporation*, Washington: The Brookings Institution, 1945.

<sup>12</sup> For example see T. C. Shelling, "An Essay on Bargaining," *American Economic Review*, June 1956; Harvey M. Wagner, "A Unified Treatment of Bargaining Theory," *Southern Economic Journal*, April 1957.

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At the commodity level also it would be interesting to know the number of times, the circumstances, and the methods of approach cooperative marketing associations of nonbasics have employed in petitioning the Secretary of Agriculture for Section 32 programs. In the dairy field, cooperatives have been busy proposing federal legislation, appearing before House subcommittees, offering testimony in federal milk order hearings, and lobbying with state legislators.<sup>14</sup> In effect they are bargaining against other claimants for whatever economic gains might accrue from a successful effort to transfer income from one group in society to another. Thus the role of cooperatives in Type III bargaining is part of the broader subject of the role of groups in the political economy. Such theory and empirical work as exists on the group process has been done primarily by political scientists but work on the group process also appears to be relevant for research in cooperatives.<sup>15</sup>

Apparently there is a great deal of circularity and interdependence among the various types of bargaining in which cooperatives engage. Some dairy cooperatives began as simple Type I bargaining associations. Since their bargaining power was found to be imperfect because of lack of alternatives they purchased manufacturing facilities and entered Type II bargaining. Simultaneously, they were engaging in the kind of political-economic bargaining here designated as Type III. Now one of the issues that greatly concerns them is whether or not they should come to a union type of organization and establish price through negotiation.<sup>16</sup> All of this tends to suggest that the role of cooperatives in bargaining is not a constant thing, that the growth process is involved with the role changing as the size and maturity of the cooperative changes, and as changes occur in the market structure for the product.

How one cooperative leader views the role of cooperatives and the interdependence among types of bargaining may be seen from the

<sup>13</sup> New York: Frederick A. Praeger, 1956.

<sup>14</sup> A description of some of the lobbying of one cooperative is found in Margaret K. Taylor, "Dairy Cooperatives in Legislative Activities," *American Cooperation*, Washington: American Institute of Cooperation, 1952.

<sup>15</sup> Arthur F. Bentley, *The Process of Government*, Bloomington: Principia Press, 1936, David B. Truman, *The Governmental Process*, New York: Alfred Knopf, 1951, and Bertram Gross, *The Legislative Struggle*, New York: McGraw-Hill, 1953 are standard references. The theory of the group process is also elaborated in the first chapter of Earl Latham, *The Group Basis of Politics*, Ithaca: Cornell University Press, 1952.

<sup>16</sup> A. L. McWilliams, "Bargaining Cooperatives Must Keep Up to Date," *American Cooperation*, Washington: American Institute of Cooperation, 1955, p. 382.



following: "I am convinced that the greatest service a dairy cooperative can render to its members, and to all dairymen, is through persistent, well-planned, skilfully applied efforts toward the promotion locally, sectionally, and nationally of economic and legislative conditions as well as public relations work that will make . . . possible . . . the building and maintaining of the best possible dairy-product price levels."<sup>17</sup> This kind of lead needs to be followed by economic research.

The economic theory examined here does not tell what the role of bargaining cooperatives is or should be, but it does suggest lines of research on what they could be doing and the possibilities and limitations of pursuing different roles. These models operate at the micro level of analysis. They are most useful for rather specific markets in a particular time and space dimension. There is great temptation when a person first considers the theory of monopoly to apply monopoly techniques for the solution of price and income problems at the level of the economy as a whole. The evidence of the past 25 years or so is that a macro-economic problem requires macro-economic theoretical tools. At least the problem of depression was intractable to micro analysis but yielded with an appropriate macro analysis. Perhaps an explanation for the failure of some parts of the cooperative movement is to be found in the misapplication of micro-economic analysis to the macro problem of a depressed agriculture.

In only one instance does the simple aggregation of micro analysis lead to a macro-economic model. That is the case of pure competition. Evidently, this model has become fixed in the minds of many students of cooperation. Blindly, it seems, they believe that every farmer cooperative is an atomistic firm or if not a firm, because it is integrated as an extension of the farm, it must be atomistic as farms are. From this point the logical leap is clear to the role of cooperatives at the macro level and their functions in society. Admittedly, this is hypothesis on my part that the competitive model is so used by writers on cooperatives. But how else can one explain such statements as the following?

"The function of a bargaining association is to facilitate the establishment of a price in the market which would be the same as or which would approximate the price that would be arrived at under conditions of pure competition."<sup>18</sup>

" . . . The primary role of cooperatives is to overcome some of the defects and limitations of the capitalistic economy. Important among these are imperfections in the competitive process which interfere with the free allocation of resources in accordance with consumer preferences. A fundamental objec-

<sup>17</sup> Stanley H. Benham, "Standards of Good Management in Dairy Co-ops," *American Cooperation*, Washington: American Institute of Cooperation, 1952. pp. 473-474.

<sup>18</sup> G. Alvin Carpenter, *Bargaining by Fruit and Vegetable Associations with Processors*, USDA, FCS, Service Report No. 3, February 1954, p. iv.

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tive of the cooperative plan of business is to improve competition and to enlarge the area in which the competitive pricing mechanism is effective."<sup>19</sup>

Another writer holds that the role of a cooperative is to be successful in a business sense, an economic sense, and in a cooperative sense. He adds,

"It is, of course, possible for a farmers' organization to be a business success and still not be a success in either an economic or a cooperative sense. . . . Success in an economic sense means helping farmers overcome the many disadvantages of their small-scale operations, increasing efficiency in marketing and purchasing, eliminating competitive wastes, reducing monopolistic practices and other competitive defects and abuses in the markets, bringing about a better adjustment of market supply to market demands, improving the standardization, grading, and quality of products, and so on."<sup>20</sup>

To me this reads acceptance of pure competition for the individual and in the aggregate as the role of cooperatives. One writer has held that acceptance of pure competition as a social and scientific norm is one of four "economic principles and attitudes which, on matters of farm policy, have reduced the once-influential profession of agricultural economists to the role of neglected scolds."<sup>21</sup> This shoe was created for some good-sized policy feet, but it appears equally well to fit some feet in the cooperative field. Acceptance of this model is not apt to produce useful research in the role of cooperatives.

Lest these remarks be considered ill-tempered, let me say they were not meant to be so. The good hearts and fine intentions of the farmers' cooperative movement are not to be questioned. Purely as a matter of economic analysis some serious questions must be raised about the economic role of cooperatives. Frankly, in my opinion, the role of cooperatives as devices for achieving the competitive norm is not only unrealistic but misleading in the analysis of cooperative problems in the modern economy. Survival in the coming world of monopolies will not be easy, but the evidence already suggests what is necessary for survival. If cooperatives are going to be around to serve farmers in the future, they must fight to enhance their market power by every economic, organizational, and legislative device available. In the aggregate, society may hope that the struggle to achieve monopoly power among all buyers and sellers might produce reasonably workable competition, reasonable price and output results, and a reasonably satisfactory distribution of income.

<sup>19</sup> E. Fred Koller, "Cooperatives in a Capitalistic Economy," *Journal of Farm Economics*, November 1947, and reprinted in part in Frederick V. Waugh, *Readings on Agricultural Marketing*, Ames: Iowa State College Press, 1954, p. 377.

<sup>20</sup> Frank Robotka, "Research on the Cooperative Organization Itself," *American Cooperation*, Washington: American Institute of Cooperation, 1951, p. 273.

<sup>21</sup> J. K. Galbraith, *Journal of Farm Economics*, August 1956, p. 880.

## DISCUSSION: THE ROLE OF COOPERATIVES IN BARGAINING

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Dr. Clodius has rejected his original assignment as an impossible task and has declared that existing research findings are completely inadequate for determining the role of cooperatives in bargaining. As an alternative he has chosen "to examine the theoretical contributions from economics as a discipline that might be useful in conducting a research inquiry into the role of cooperatives in bargaining." He has presented a fresh and interesting approach to the subject, and his ideas certainly should serve to stimulate at least some research workers who are probing into the problems of these farmer-owned organizations.

In his introductory remarks, Clodius has emphasized that if cooperatives are to survive "they must adapt themselves to the basic structural changes in market organization outside the farm." Perhaps it was not intended to imply that static influences are inherent in all cooperative activities. Most of today's cooperators would insist that the role of cooperatives should be dynamic and bring about at least some of the ever-evolving structural changes in market organization. Survival, yes! But, even more, if this longevity is to be vigorous and youthful, there must be more cooperatively-inspired pacesetting that would add to the list of such innovations as open-formula feeds, high-analysis fertilizers, bulk handling of milk and other commodities, quick-frozen fruit juices, and numerous others that have been cooperatively pioneered.

In his definitions I feel that Clodius has provided an interesting trichotomy and a grouping that satisfactorily describes in familiar terms the market power relationships in imperfect markets. However, some theoreticians likely would argue that Type II is a part of Type I and, further, that Type III bargaining should not be construed as market behavior per se.

In another category of definitions, I should like to have had a clearer definition of economic research as he uses it. As one who has spent several post-student years in cooperative research among the group indicted, I cannot help coming to the defense of research efforts that seemingly have been dismissed as inconsequential and noneconomic in nature. This seems to fall into line with the views of some theoretically-oriented economists who speak disparagingly of these efforts as "counting" studies and unworthy of the research connotation. Perhaps it is a matter of syntax that could easily be reconciled, but I am steadfast in my belief that business research efforts on such problems as membership, personnel, management, organizational structure, and the like, are the

foundation blocks on which economic studies of greater depth are built. They provide grist for the decision-making mills, and guide many decisions that are most important in cooperative success and in this element of survival that Clodius has rightfully stressed.

In the realm of membership relations, for example, he has pointed out the greater control members have over cooperative management than do stockholders of noncooperative firms. It follows, then, that studies in this area on loyalty, on understanding of cooperative policies, on effectiveness of field men, and similar studies can contribute greatly to decisions that influence economic events. Moreover, as cooperatives lead the way or follow the pack in basic structural changes in market organization, these studies can serve as important guideposts for research workers who someday may devise the precise theoretical model or models for determining the role that cooperatives now play or should be playing in bargaining. In this connection Clodius states that "most of what passes for research in the economics of cooperatives is theoretical model building at best or restatement of faith at worse." Is not theoretical model building an essential part of research?

Ideas suggesting lines of inquiry into the role of cooperatives in bargaining have been outlined separately for each of the three types named. Precise models are not presented. Neither has he adhered strictly to Marshallian principles of economics nor to the usually accepted Rochdale principles. I am certain several lively graduate seminar sessions could be used in discussing any or all of these thought-provoking ideas.

Although the bilateral monopoly model is an interesting teaching tool, my thinking is that it is too unrealistic to receive much consideration from research people at the cooperative level. The assumptions are restrictive beyond the realm of experiences of any known agricultural cooperative. In particular, the caution signal should be well heeded with reference to the assumption that profit is the single variable to be maximized in cooperative bargaining. As we know so well, a farmer is interested in cooperatives chiefly because of the effect they have on his net income, an item that cooperatives might influence appreciably even while operating at a loss rather than at a profit. Moreover, many associations exist solely for providing farmer members with service functions.

With reference to an investigation of the limits of price in a bilateral monopoly, are we expected to assume that knowledge is so perfect that there will be no uncertainty regarding prices? Unless there is a degree of certainty, how can any legitimate revenue functions be assumed? In citing examples of California experiences, the important point here is that some market structure theory would be helpful in understanding marketing policies of bargaining cooperatives. Within this context,



would not the related theories of oligopoly-oligopsony, rather than monopoly-monopsony, provide the useful framework for analysis? I am inclined to ask this question because in the suggestions for cooperative research in interfirm competition, Clodius has told us, "Whatever the role of cooperatives, apparently their function must increasingly be carried out within the context of oligopoly and giant firms."

Undoubtedly research findings on the activities of cooperatives in political-economic bargaining would make interesting reading in the Wesley McCune vein. Methodology would indeed be difficult and, since empirical data are asked for, I assume that in this sphere Clodius is not model building. An important omission seems apparent in the suggested research ideas expressed, and particularly with reference to analysis and interpretation of findings in this area. How do you measure or weigh the unseen and unreported activities not revealed in the public transcripts of hearings? Where does bargaining really take place—in the smoke-filled rooms prior to the official event, in a golf foursome, at a let's-see-what-we-can-work-out dinner, in a country club cocktail lounge?

In the context of the quotations Clodius read from cooperative writers, he has good reason to interpret their views as acceptance of pure competition for the individual and in the aggregate as the role of cooperatives. I am wondering, however, if this interpretation is entirely accurate. Personal acquaintance with some of these writers makes me feel that they are concerned chiefly with the need to bring about changes in the imperfectly competitive market structure. Rather than advocating pure competition, at least some of these writers are thinking in terms of going from oligopsony to bilateral oligopoly as a means of improving the relative economic position of the farmer.

The gloomy term, "coming world of monopolies," disturbs me, not only for the sake of cooperatives but for other business firms as well. But, just as I have faith in our democratic processes to protect us from this overwhelming fate in the business arena, so do I have faith that cooperatives in the second half of the 20th Century will meet the challenge of survival. Although the ideas expressed by Clodius did not give the specific guides and handholds that I think we need to grapple with the research shortcomings in studying the role of cooperatives, I do feel that he has made a real contribution that could stimulate the thinking of research people whose aim is to assure the survival of farmer cooperatives as an integral part of our nation's economy.

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## ROLE OF FARM COOPERATIVES IN EFFICIENT DISTRIBUTION

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IN THIS paper I will use the term distribution in two ways: (1) physical movement of commodities and related farm services, and (2) functional distribution of economic returns to farmers through cooperative effort.

### *Cooperative Objectives and Distribution*

A look at basic reasons why farmers organize and patronize cooperatives will help bring into perspective the contributions their organizations are making to efficiency in distribution. Increased net farm income is the motivating force back of the business activities of farmer cooperatives. These associations help members achieve this objective by getting them more for the products they sell and by savings on the production supplies and services needed in day-to-day farm operations.

Cooperatives help farmers increase their net income in a number of ways. Marketing associations enable patrons to increase their bargaining power in the market place. Moreover, they help to reach and to expand existing markets and to develop new ones—something that often would be impossible if each acted as his own salesman. Marketing cooperatives also stress quality production, payments according to grade, and systematic (orderly) marketing practices.

Through supply cooperatives farmers add to their net income by realizing for themselves the savings that result from providing their own production supplies. These associations also provide special types of production supply services such as spraying, painting, and distributing feed and fertilizer in bulk. Moreover, they make important contributions to increased farm income by handling supplies tailor-made to the specific production requirements of patrons.

For much the same reason farmers look to their service cooperatives to provide a large and growing number of general farm services. These, among others, include insurance, irrigation, credit, electric power, and telephone. In setting up their own organizations to furnish these services, farmers seek either lower costs, or, what is even more important, assurance that these services will be available.

This brief review of cooperative objectives indicates that their realization by farmer members will depend, to a considerable extent, on the

<sup>1</sup> Director, Purchasing Division, Former Cooperative Service. The writer is indebted for observations and suggestions to Dr. Joseph G. Knapp, Administrator, J. Warren Mather, Chief, Farm Supplies Branch, and Dr. Job K. Savage, Chief, Special Crops Branch, all of Farmer Cooperative Service, U.S. Department of Agriculture.

contributions that these business organizations make to increased efficiency in distribution. These contributions can be in the areas of efficiencies both in the physical movement of goods and in influencing the returns that go to agriculture as one claimant on the income from business activities.

The contributions of cooperatives to increased efficiency in distribution suggest that these organizations serve as an integrating force in farm operations.

Marketing cooperatives, because they are in direct touch with the commercial and consumer markets are in a position to interpret market trends to patrons. As a consequence these associations have done much to standardize farm products. They also have helped to assure that production practices and methods are carried out so as to produce the type of products consumers desire, at a time they want them, and of such quality and quantity as they require.

Production supply associations with their emphasis on price, service, and quality also have made important contribution to improved production practices. These efforts help tie distribution and production functions together. They enable farmers to introduce many elements of efficiency into farm operations. Besides introducing efficiencies in actual distribution practices they also lead to better production processes by moving back of this function and encouraging farmers to produce the kind and quality of products the market demands.

This is in line with the views I expressed when I was on the program of this association 10 years ago. I then stated: ". . . it is through the establishment of cooperatives that farmers can most effectively integrate their business operations. . . . in . . . integration is found a logical explanation for the capitalistic motives behind the formation of farm cooperatives. . . . It is by such integration that farmers can establish anti or, more properly, counter-monopoly instruments."

### *Economic Setting*

To explore the economic contributions of farmer cooperatives to efficient distribution, it will be helpful to relate these associations to the economy in which they are operating. First of all, it seems desirable to point out that if the economy postulated by orthodox economists actually existed, there would be little logical basis for organizing cooperatives. Under a system approaching perfect competition farmers would be assured that their products would bring the going market price. Likewise they would be able to obtain production supplies and services on the same basis. They could expect to gain little, if anything, by setting up and operating their own business agencies.

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To any one who has been associated with the modern marketing economy the fictions in such a theory are apparent. The universal experiences of farmers, since the development of commercial agricultural operations following the Civil War, have demonstrated in varying degrees the existence of monopolistic elements in the market place. Small and scattered producers are at a disadvantage when it comes to bargaining power because these unorganized farmers find themselves dealing with a limited number of large-scale and powerful marketing firms.

The extent to which concentration of economic power has taken place throughout the economy was well pinpointed in the July 1955 issue of *Fortune Magazine* which indicated that in 1954 there were 500 business firms in the United States that accounted for 51 percent of all sales, 56 percent of total assets, and 66 percent of net profits. These same firms, however, represented about one-hundredth of 1 percent of the industrial firms in the country. Thousands of local retail merchants have joined in cooperative efforts in an attempt to offset this concentration of market power.

Likewise, through 10,000 farmers' marketing and purchasing associations and a similar number of service cooperatives the farmer is seeking to offset the disadvantages of his relatively small and scattered operations. These farmer businesses now account for about one-fourth of farm sales at some stage of the marketing process, provide around one-sixth of their production supplies, and furnish large proportions of many important farm services.

They represent approximately 2 percent of all farm assets and their yearly savings amount to about 2.25 percent of the farmers' net farm income. Of course, the savings reported are achieved by not calculating interest on much of equity capital farmers have invested in their cooperatives. It is equally true, however, that these savings do not take into account increases in farm income that result from the many salutary influences cooperatives have on practices in commodity, production supply, and farm service markets.

In this discussion I will examine the interrelated meanings of distribution from the standpoint of their application to cooperatives, then consider the contributions that cooperatives are or are not making to efficiency in distribution, and finally discuss the opportunities that cooperatives have for contributing to more efficient distribution.

#### *Physical Movement of Commodities and Related Farm Services*

With the growing commercialization of agriculture, producers and consumers have become further separated. This has done much to bring about the development of the type of market economy we have today.

While farms, notwithstanding the impacts of research and technology, have remained relatively small business units, the economies generally inherent in large-scale operation have become quite pronounced in the physical distribution of farm products.

Farmers have looked to their cooperatives to help strengthen their position in the present large-scale business economy in which they find themselves. Their organizations have become vehicles for reducing costs, expanding market outlets, and for giving members a more intimate knowledge of the operations of the American business economy.

The contributions of marketing, production supply, and service cooperatives in increasing the efficiency of physical distribution of goods and services will now be examined.

*Marketing cooperatives.* I already have indicated that as closely as we can determine, cooperatives handle through one or more of the stages of marketing about 25 percent of the commodities farmers sell. For certain items the proportion is much higher. For instance, it is 60 percent for citrus, 45 percent for milk and butter, and 35 percent for grain. For some it is lower—20 percent for apples, 12 percent for livestock, and 10 percent for cotton.

In physically handling these products, farmers get the benefits of the savings that result from carrying on these business operations themselves. Data from a study by Farmer Cooperative Service suggest that some three million farmers realize annually about \$175 million on the farm products they market through their approximately 7,000 marketing cooperatives.

This is a concrete demonstration of the savings realized by farmers when they assume market risks and provide necessary capital to have their cooperatives actively participate in the physical distribution of commodities. Through increased bargaining power and through reduction of market costs, farmers—by the use of their own business organizations—have realized for themselves the savings that result from increased efficiency in distribution.

It is not usually recognized that many of the benefits producers realize from improvements in the marketing system are the results of their own efforts in building better marketing machinery. A few illustrations will further emphasize this point.

Let us consider turkey marketing. Our studies show that of the 23 major turkey cooperatives that handle perhaps 15 percent of the nation's turkey output, 20 pay growers on a "ready-to-cook" weight and grade basis. This takes the gamble out of weight yields and grades. It gives the producer the benefits of premiums on flock performance and quality production—factors that benefit not only the grower but consumer as well.

Turning to milk marketing, cooperatives in many areas have been in

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the forefront in assisting their patrons to organize their operations so as to gain the advantages that come from converting to bulk-milk tanks.

Another example of cooperative pace-setting is found in grain marketing. The demand for increased elevator space that has developed with combine harvesting has been met to a considerable extent by hundreds of cooperative grain elevators that dot the country-side.

Through their own investments, farmers have put up the facilities to store and grade grain, protect it from insects, and improve handling practices. Patrons of these cooperatives have benefited by making these investments and assuming the necessary risks—marketing services that have increased distribution efficiency. Moreover, through establishment of research facilities to test the baking qualities of wheat, farmer organizations are contributing to efficiency in grain distribution. They are able to assure millers of the quality of their product and can provide them with wheat that meets exact industry specifications—an important step in increasing distribution efficiency.

Fruit and vegetable growers, through their own marketing agencies, have developed wider markets and are doing much to provide the quality and quantity of products consumers demand. By adding processing facilities many cooperatives have helped expand markets for members and at the same time provide ready-to-use products that have lightened the load of the housewife.

*Production supply cooperatives.* Modern agriculture requires increasing amounts of production supplies. In the decade of the 1930's, not more than 30 percent of the farmer's cash income went to obtain these supplies. Now this proportion has increased to nearly 50 percent. Farmers obtain annually about \$2 billion of production and other supplies through some 3,300 specialized supply cooperatives, together with another 4,000 marketing associations handling production supplies as a sideline. The proportions provided by cooperative are 20 percent for feed and petroleum products, 18 percent for fertilizer, 12 percent for seed, 2 percent for farm machinery, and approximately 5 percent for other supplies and equipment. Through patronizing their supply cooperatives, some 3 million farm members now realize savings of approximately \$90 million a year. This is a sum equal to about 4.5 percent of their purchases.

Numerous examples illustrate how these savings are realized. One is the pace-setting contribution of these cooperatives in handling high analysis fertilizer. For instance, by increasing the units of plant food per ton from 20 to 40 units, as cooperative manufacturers sometimes have, costs of plant food units have been lowered between 10 and 15 percent, or from \$4 to \$6 a ton. This is due to substantial savings in transportation and handling. These savings are of increasing importance in view of the growing demand for fertilizer throughout the country.



Moreover, because the cooperatives are in effect the farmers' own businesses it is easy to see why emphasis is on service and quality. In many areas these associations have taken the lead in providing soil testing services and in blending a prescription-type fertilizer that helps farmers realize the most effective returns for production expenditures.

Another illustration of contributions of production supply cooperatives to efficiency in distribution is found in the bulk delivery of feed and fertilizer. In addition to lower costs and better service, farmers realize the added benefits of savings in labor requirements.

Although it is impossible to put a dollars and cents value on the benefits resulting in both production and distribution realized through handling quality seed—seed adapted to various geographic areas and production purposes—contributions here, too, are significant and put cooperatives in the vanguard when it comes to operating in the interest of farmers.

The relatively higher savings per dollar of business realized for farmers by supply associations as compared with marketing associations is in part due to a greater degree of both vertical and horizontal integration in their operations. Back of the distribution activities of local retail cooperatives are a large number of federated wholesale associations. These regionals also actively engage in processing and manufacturing. For example, of the total business of cooperatives, present indications are that approximately 85 percent of their feed, fertilizer, and petroleum products are processed in cooperative plants. In the case of petroleum and fertilizer cooperatives, some of this integration is "across the board" and terminates in exploring for crude oil and mining some of the rock phosphate required in fertilizer manufacturing.

*Service cooperatives.* The growing interest of farmers in using service cooperatives is indicated by the fact that there are now some additional 8,000 associations providing an expanding list of services for farmers. Currently their own cooperatives provide farmers more than half of the mutual fire insurance, two-thirds of the electric power, one-third of the irrigation water, and perhaps 20 percent of the various types of credit they use. It is conservative to estimate that farmers realize annual savings of \$50 million yearly through the use of services provided by these cooperatives. Besides, the savings attributable to their lower service charges are perhaps equally important. There also is the added benefit of making services available that otherwise often could not be obtained. Obviously farm services have become an important adjunct of the modern farm operations.

#### *Functional Distribution*

I have emphasized that the savings realized through cooperatives in handling goods and services is but a means to an end and that end is

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increased farm income. Cooperatives are one way to insure that the farm factor of production will receive a return in line with its economic contribution. By combining individual economic powers into an aggregate its economic power may be many times the total of the individuals.

Cooperatives must show performance—performance that through efficiencies in distribution demonstrate opportunities to increase net farm income—if they are to influence the proportion of returns from business activity that goes to farmers. Such influence, then, as cooperatives have on functional distribution relate this aspect of distribution to agricultural policy and to concepts of equity for agriculture.

Farmers can achieve for themselves a greater proportion of the returns from their production if they broaden their business operations to include distribution as well as production. It often has been said, but I believe mistakenly so, that farmers are essentially producers and that they possess neither the inclination nor the skill to carry their production on through the various channels of trade. While this is true when applied to individual farmers, it is not necessarily true when, through joint action, they avail themselves of skilled processing, distributing, and purchasing personnel to further extend their business operations. This is a practice that has become increasingly common among all segments of industry and it is only logical that it is one farmers have sought to take advantage of.

*Patronage refunds—a cooperative technique for functional distribution.* Here is where the cooperative way of doing business has special application. Through its patronage refund technique and the established policy of limiting returns on equity capital, this method of doing business is unique in its departure from the practices of ordinary business enterprises when it comes to the distribution of returns from business activity. Traditional business has been built and developed on the principle that profits are realized in accordance with investments. In the cooperative, however, benefits are in proportion to the amount of business transacted through the association. While farmers, through their cooperatives, provide capital for productive purposes and participate in furnishing management, all returns above "reasonable" allocations to these factors go to members on a patronage basis.

*Basis for functional distribution of income.* With respect to the functional distribution of wealth, three ideas have developed. One is the allocation of returns to those engaged in production in proportion to their economic contributions. This emphasizes the market value of goods and services. Another is the assurance of minimum standards or specified amounts of income to various groups—an "equality" or "proper share" concept. A third is the modification of existing inequalities in the dis-

tribution of income through changes and improvements in prevailing market structures.

Ideas one and three are in accordance with the best traditions of cooperative philosophy. Cooperative leadership with its aversion to the type of government programs required to activate idea two, if one might judge by expressions, often is inclined to look with disfavor on the establishment of minimum standards and specified amounts of income.

Those who look upon cooperatives as "pilot plant" operations or as a "measuring stick" are entirely agreeable to the idea of increasing farm wealth in proportion to the economic contributions cooperatives make. I have mentioned that our studies show the increased returns farmers realize through their cooperatives now approximate one quarter of a billion dollars annually. These increases in returns are in proportion to the business members do with their cooperatives and represent rewards for extending their business operations by furnishing capital, bearing risks, and, through directors, assuming responsibilities for management.

Those cooperative members who are impressed with the necessity for modifying existing inequalities look upon their cooperative association as going even further than giving farmers the benefits of the economic contributions in proportion to their participation. They primarily look upon the economy in which farmers are operating as one in which they desperately need increased bargaining power. They see sources of profits arising from fluctuations in the business cycle, changes in consumer demand, and various government policies including administrative and court decisions. To them cooperatives are the most effective vehicle for countering these forces. As spokesmen for agriculture in the business world, cooperatives can give members more bargaining power to help them deal with the concentration of economic power that has come to characterize the business environment in which farmers sell and buy.

*Cooperatives and agricultural policy.* To the extent that changes and improvements in functional distribution can be introduced by cooperatives in the interest of their members, questions of agricultural policy arise. In this connection I would like to suggest that for the past 25 years cooperatives largely have been a neglected force in agricultural policy—a force that has not received adequate attention as the means to which the economic position of farmers may be improved.

There are, of course, a number of reasons for this situation. One was the premature emphasis given to cooperative efforts as the solution to problems of agriculture through the passage of the Agriculture Marketing Act of 1926 and the establishment of the Federal Farm Board in 1929. These developments served only to demonstrate that under widely adverse conditions existing at that time, cooperatives did not then have

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the leadership, the economic resources, or the volume of business to fill the breach.

It may be, however, that cooperative leadership while disclaiming the Sapiro Doctrine of market control has been too inclined to remain on the sidelines when it comes to dealing with critical economic problems confronting agriculture. Certainly at present, foundations of agriculture policy are rooted elsewhere. In the writings and utterances of those expressing themselves on agricultural policy and/or formulating farm programs, cooperatives generally have received but scant recognition as a means of helping farmers deal with major aspects of their problems.

The fact that the role cooperatives can play in agricultural policy has not been adequately appreciated is demonstrated in the lack of expression on this subject. For instance, the recent report of the Committee on Agriculture Economics of the Social Research Council scarcely mentions cooperatives as a means for dealing with problems of agriculture. The same omissions are conspicuous in recent books on the general subject of agricultural policy.

I submit that these omissions are largely due to the fact that those expressing themselves on matters of agricultural policy have not kept abreast of many of the recent developments in agricultural cooperation. The dynamic features of these integrated farmer businesses have been ignored, and there is a tendency to still think of cooperatives in terms of their performance of 25 years ago.

Compared with the 1930's, cooperatives have made remarkable progress in providing manufacturing and processing services. Compared with that time, a new membership consciousness and understanding as to what can and cannot be accomplished through cooperative effort now exists. Finally, compared with 25 years ago a new leadership capable of extending its visions to new horizons exists in agricultural cooperation. Evidences of these changes are found in the illustrations of pace-setting performances in the physical distributions of commodities that I referred to previously.

Cooperative leaders, in growing numbers, are now expressing the views that solution to many of the problems of agriculture rests with the farmers themselves and that much can be accomplished through their cooperative organizations. It is not the purpose of this paper to evaluate, even if it were possible to establish, the possible role that cooperatives could or should occupy in dealing with problems of agriculture policy. I believe, however, that it is rather obvious that cooperatives can play a more important role than they are now doing in the area of functional distribution, particularly if their leadership demonstrates the ability to grapple in a statesmanship manner with these problems.



### *A Look Ahead*

If cooperatives are to influence the functional distribution process in the interests of farmers, it will call for a good hard look at the performance of these organizations.

Cooperative leadership in the future, even more so than at present, must realize the growing importance of tailoring objectives to the changing needs of farmers. This will call for coordination of efforts by various types of associations.

Cooperative leaders also must recognize that both marketing and farm supply and service associations can contribute to improvements in distribution efficiency by lessening the grip of the low-income vise in which farmers currently find themselves. Marketing cooperatives, as one jaw of this vise, can increase returns to farmers. Supply and service cooperatives, as the other jaw, can provide production supplies and services at lower cost and often with improvements in the qualities of goods furnished and in performing the various services farmers require.

Cooperative leadership, too, if it is to deal with broader aspects of agricultural policy, must demonstrate ability to coordinate efforts by avoiding unnecessary duplication and competition.

Finally, cooperatives must show a willingness to plan for better performance by dealing effectively with problems of selecting, training, developing and paying personnel to cope with the larger jobs ahead.

### *Observations*

The objectives of farmers' marketing, supply, and service cooperatives are in line with their efforts to achieve efficiency in the physical distribution of the various products they handle and in the services they perform. When a look is taken at the economic setting in which these associations operate, it also is evident that because of their distinctive principles of distribution they are in a position to influence the returns to agriculture.

Careful examination of cooperative performance indicates that these organizations are contributing to increased efficiency in the physical distribution of goods. This makes it possible for them to serve as an effective force in representing farmers in seeking greater returns for their contribution to business activity.

It is not generally recognized that cooperatives are the one agency that, through increased efficiency in their distribution efforts, pass the benefits of better performance directly on to farmers. In this respect cooperatives have been a neglected force in agricultural policy—a situation growing out of inadequate understanding and appreciation of how they operate and what their basic objectives are. Opportunities for better



operating performance, however, need to be recognized and taken advantage of by cooperative leaders if greater efficiency in distribution is to be realized.

### DISCUSSION: ROLE OF FARMER COOPERATIVES IN EFFICIENT DISTRIBUTION

WENDELL C. BINKLEY  
*University of Kentucky*

It truly is a difficult assignment to comment intelligently on a paper of the scope just presented by Dr. Abrahamsen. Perhaps I can only indicate within the next 10 minutes or so the impossibility of this for me. At the very outset, lest my later comments may suggest otherwise, I want to make it quite clear that in my humble opinion Dr. Abrahamsen has provided much more material for careful thought and discussion than the limited time here available will permit. I'm sure he will welcome comments, criticisms and suggestions from those here, as well as from others who subsequently read and study his observations.

Nothing new has been said. No new ideas have been advanced. Little imagination has been displayed. Rather, the author has chosen to refresh our memories on things that have often been repeated, perhaps in recent years altogether too exclusively at the undergraduate level of instruction. Perhaps some of you have been less than stimulated by the recitation of cooperative accomplishments. In doing this, however, Abrahamsen has touched at several points on the possible implications of cooperative developments in areas characterized by varying degrees of imperfect competition. He has not had the opportunity to explore these in any detail. Herein lies a fruitful field of inquiry warranting a more intensive application of the best efforts of well-trained economists of today and the future. Herein also lies one of the most fruitful fields of inquiry for advanced graduate students in agricultural economics.

To one who has had only a limited exposure to economic theory, including the various approaches to the study of imperfect competition, mixed with some several years of "practical" experience in working with a rather wide variety of farmer cooperatives, it has seemed rather paradoxical that the study of agricultural cooperation has proven no more intellectually stimulating and challenging—as viewed by the relatively small numbers of advanced students who have chosen to prepare theses in the area. This may be in no small measure attributable to the carry-over of the orthodox classical doctrine regarding competition, a concept of a type of competition that never really existed, and the usefulness

of which has largely been relegated to sophomore economics. Certainly in recent years the concept has proven less than useful for most economic analyses related to the real world in which we live.

Some concern may be expressed regarding the definition of the term "distribution" given by Abrahamsen, and the depth of his penetration of the two selected areas chosen for discussion as parts of distribution. Of more concern to me is what appears to be a vague definition of the term efficiency. One has only to attempt such a definition, in the particular context, to understand the omission.

Abrahamsen clearly reiterates the economic motivation as dominant in farmer cooperatives, and points out the integrating influence of farmer cooperatives in production and distribution. The brief discussion of how marketing, purchasing and service cooperatives help accomplish the economic objective of increased net farming income for those who use them might well have been omitted in the interest of brevity, and perhaps also because this accepted tricotomy may contribute little to the economic analysis of farmer cooperatives. Presumably this decision was influenced to no small degree by the availability of data relating to farmer cooperatives so classified, and subsequently introduced in the paper.

The July 1955 *Fortune Magazine* data relating to the increasing concentration of economic power in the economy of the United States is impressive. Its usefulness for analyzing the role of farmer cooperatives is limited because there is no indication of the concentration and the structure and organization in specific industries closely related to and servicing agriculture. These bear directly on the particular ways in which imperfect competition manifests itself, the alternatives available to farmers through cooperatives in coping with them and the ultimate influences on economic distribution.

The given measures of the importance of farmer cooperatives as means by which individual farmers cope with the realities of large-scale business organizations, are not nearly so impressive as would be the case if there could be developed some way to roughly quantify their contributions toward influencing the nature of competition. Certainly "savings" in marketing and purchasing associations, presumably as here used to represent the measurable dollar savings derived from operating statements of cooperative associations, are not insignificant when they represent 2.5 percent of net farm income in the United States. A horseback opinion is that these are relatively insignificant, however, in contrast to the effects on net farm income through the various "salutary" influences mentioned. Further, one may presuppose that the savings become more modest as the salutary influences become more manifest.

Abrahamsen provides some indication of the contributions of market-

ing cooperatives to the physical distribution of goods and services, but the measure of "one-fourth" of all commodities which farmers sell moving through their cooperatives at "one or more stages" in marketing perhaps conceals more than it reveals. What percentage of these are "one-stage" operations, involving only the first or second link in the marketing chain—where only a relatively small percent of the consumers' dollar is spent? Annual savings of \$175 million for 3 million farmer-users of marketing cooperatives is not to be ignored, but how adequate is this as a measure of their total influence on net farm income in the United States, and is this clearly related to the measure of distribution efficiency? The example of turkey marketing appears more convincing than those drawn from milk, grain and fruit and vegetable marketing, perhaps because the latter three are only partially explored, perhaps also because the 20 turkey marketing cooperatives more clearly demonstrate the unique characteristic of farmer cooperatives permitting the consumers' preferences to be translated, through the price mechanism, all the way back to the primary producer, rather than becoming rather substantially lost in the marketing channels.

I am pleased that Abrahamsen has chosen to emphasize the potential influence of farm supply purchasing cooperatives on net farm income. This area of cooperative development represents a relative newcomer, both in terms of the increasing significance of purchased production supplies in modern commercialized farming, and also in the progress made by cooperatives in recent years. Again, the \$90 million dollars in "net savings" in all probability provides no true measure of the economic significance of these cooperatives' contributions. Illustrations given of the "pace-setting" influence of cooperatives, while sketchily drawn, are convincing. Other even more dramatic examples of the "salutary" influence of cooperatives could be cited by those who have worked closely with such organizations—influences at the local market level and influences on pricing policies of competitors serving large agricultural areas, and thus not reflected at all in the "net savings" measures. Perhaps some of the techniques of vertical integration in purchasing cooperatives may have applicability in cooperative marketing. At present, however, the contrasts appear more prevalent than the similarities.

Perhaps the discussion of the technique of patronage refunds in cooperatives would have been strengthened by some statement as to the concept in a cooperative of purchasing men, money and machines in the market place at "going rates" to operate the cooperative, and returning to member-users, who also are the primary risk bearers and makers of the real managerial decisions, the residual economic benefits—or economic losses.

It is particularly refreshing and stimulating to have Abrahamsen's statement regarding farmer cooperatives and agricultural policy. Ideas on the functional distribution of wealth largely reflect the broad area of possibilities open to cooperatives in influencing the organization and structure of industries servicing agriculture. Increased bargaining power is only one important facet of this, with possibilities in the market place. I sincerely hope that the observations regarding farmer cooperatives and agricultural policy will strike a responsive chord and stimulate many of us to give more consideration to the place of farmer cooperatives in future agricultural policy formulation. Unless this is done, I have the feeling that most students of agricultural economics will find themselves still reviewing the historical developments of farmer cooperatives in the United States up to a quarter-century ago, with all their mixtures of limited successes and abysmal failures, at the same time that present and future opportunities are being realized by rather substantially different cooperatives proceeding largely without the advantages of an up-to-date knowledge, understanding and appreciation on the part of otherwise well-trained agricultural economists, and without the potentially valuable contributions of their thinking and training. We are indebted to the author for reopening a topic that has been rather sorely neglected by agricultural economists in recent years.

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## CHANGING PATTERNS OF CONSUMPTION

Chairman: Aubrey Brown, University of Kentucky

### IMPLICATIONS OF CHANGING PATTERNS OF CONSUMPTION PREFERENCES AND MOTIVATIONS

HERMAN M. SOUTHWORTH  
*Pennsylvania State University*

THE topic assigned me is certainly broad enough that I cannot complain of being limited for things I might talk about. Yet I have chosen to start with a digression on a different subject: Implications of our changing motivations in *studying* consumption of farm products.

Two lines of development in agricultural research seem to me to converge in forming our present interest in this subject. The first is in agricultural marketing, the second in household economics and nutrition.

Farmers in the United States have had recurring marketing problems as far back as we have record. The Whiskey Rebellion of the post-revolutionary period was an early illustration. Grain producers on the then western frontier had no adequate transport to market for their grain. So they processed the product into whiskey, a condensed form transportable by horseback over trails, rather than by wagons that would require roads. The attempt of the new federal government to obtain revenue from a tax on distilled spirits they looked upon as a threat to their livelihood. They rose in armed rebellion, dealing harshly with a number of federal agents. The rebellion was put down by federal troops, but the incident was a stimulus to the early building of roads and canals.

Farmers also have historically been the victims of exploitation in the market, both through sharp practices of dealers and through monopoly. Public efforts to help them with these problems have taken the form of specific regulatory laws such as the Grain Standards Act, the Perishable Agricultural Commodities Act, the Packers and Stockyards Act—to mention only a few—and the provision of services like crop estimates, market news, grading and inspection. Farmers were influential also in enactment of general economic legislation like the Interstate Commerce Act and the anti-trust laws to curb monopoly.

The more general marketing problem of farmers, however, has been recurrent maladjustment of production relative to demand. Hard times resulting from this cause have historically been an underlying reason why the problems previously mentioned became so acute as to demand public action. Most of the present regulatory and service programs of



the Department of Agriculture, for example, were initiated during the agricultural depression following World War I.<sup>1</sup> The attack on this more fundamental problem of maladjustment gave rise to the outlook program. Agricultural depression was the justification for public support of research on marketing margins and on ways to reduce marketing costs through greater efficiency, so as to minimize margins. Public support has included, likewise, encouragement of farmers' cooperative marketing associations, storage and price-support measures, surplus disposal programs, marketing agreements and orders, and marketing quotas. Most recently low farm income has justified public support of research to develop new uses for farm products and, more generally, to widen market outlets for farm products at home and abroad.

Most of the public measures I have mentioned are not directly concerned with consumption. But at least two of them—outlook forecasting and research to widen markets—have required us to undertake research in this field.

Meanwhile, another approach to the farm problem has led us to this same destination. The need of farm families for help in making the most of low incomes and limited sources of supply for goods needed in family living was a major justification for early public support of research and extension in home economics and human nutrition. Actually, of course, research in these subjects was not exclusively applicable to problems of farm families, nor were farm people unique in their need for such help. Particularly during the Depression, public interest in this work broadened to recognize benefits to consumers generally. This interest was reinforced during World War II by our increased public concern with nutrition as affecting health and with making best use of restricted food supplies.

Since then has come realization of some community of interest between family economics and nutritional research and related educational effort designed to raise standards and levels of consumption, and the effort to widen markets for farm products. This is not to say that the two run always in the same direction, nor, to the extent that they do, that there has always been joint respect for this fact by the parties concerned, much less full exploitation of joint interests. But communication has been helped through joint participation in marketing workshops. And cooperative conduct of the 1955 Household Food Consumption Survey is a large-scale recognition of common interest between workers in household economics and in market development. The outlook people, also, had a finger in this pie, and it is appropriate that they should, for

<sup>1</sup> Several were, more precisely, a perpetuation of emergency war-time measures undertaken in connection with government supply programs.

study of changing consumption patterns is important to their work too.

Here, however, I should perhaps draw a logical distinction. Outlook work is concerned with forecasting. Methodologically for this purpose, it can properly turn first attention to statistical models based on correlation and regression, in which liberal use is made of the *ceteris paribus* assumption. Consumer education and market development work, contrariwise, both have as their primary objective the influencing or modification of consumer behavior—which means making the *ceteris non-paribus*. Such research requires different techniques, and methodological progress in it depends in a fundamental way upon developing an *understanding* of consumer behavior and its motivation.

I do not mean to imply that an understanding of consumer behavior is any handicap to the outlook worker. Quite the contrary, it can be a valuable guide to him. Indeed, the best forecasters are those with an instinct for knowing when to adjust their projections to allow for things like changing consumer behavior. But the consumer educator or market developer cannot, except in a quite limited and faltering manner, do any really useful work without some fundamental understanding of what makes consumers behave.

This brings me back to my first thesis—that as agricultural marketing researchers our needs and our approach to my assigned topic have changed over the years. The consequence is to plunge us into new types of research, new to us as agricultural economists that is, where we find ourselves sharing common quarters with the home economists, the social psychologists, and the advertising fraternity.

Ten years ago I doubt that anyone would have been asked to discuss the topic assigned to me at a meeting of the American Farm Economic Association. Changes in consumption—yes. Consumer preferences—perhaps, but probably without the “implications-of-changing” prefix. And certainly not “motivation,” which I interpret to mean getting inside the consumer’s mind to find the basic drives that make him behave as he does. This is in the field of the social psychologist. Yet we now find ourselves endeavoring to make it a sub-topic of agricultural economics.

In my own comments this afternoon I shall chiefly discuss some underlying developments whose implications for consumption of farm products we need to study. I shall not discuss changes in the purchases of various products. Abundant recent data on this are available, for food at least, in the 1955 consumption survey previously mentioned, which is being published in ten volumes this year. The main difficulty is the very abundance of the data—how to digest them. I have not analyzed them. Marguerite Burk, who is here on the platform, has made a substantial start on this task. She and her co-workers have published analyses of

various facets of the material, chiefly in *The National Food Situation*. They have further analyses underway, as do other workers, and I refer you to these sources.

Nor shall I present any detailed discussion of changes in consumer incomes, data on which is available from sources familiar to all of you. I shall only remind you that during and since the war consumer disposable income has increased rapidly and that its distribution among families has become much less unequal, with markedly diminishing numbers at the lower end of the scale even after allowing for the decreased purchasing power of the dollar.

Population change is another factor with which you are all familiar: the growth in total numbers; the recent resurgence of the birth rate following its marked decrease during the Depression, the continuing increase in length of life, and the resulting distortion in age structure of the population; the geographic shifts in favor of climatically attractive areas like California and Florida, in favor of metropolitan against rural areas, and locally within our metropolises in favor of the suburbs over the cities proper.

These are all background factors on which information is available, and whose implications for consumption have been statistically estimated—though the changes in population structure and distribution have perhaps not been given the attention they deserve. I am more interested, however, in some of the attendant changes in patterns of living, in people's interests, attitudes, and activities, that seem to me to have important implications for consumption if we only knew what they were.

Many of these reflect the impact of our increasingly technological culture. I suppose nothing has done more to change our ways of life than that product of technology, the motor car and truck. It has put spatial mobility into all our activities, from recreation to retail distribution. It has made suburban living possible—not only by permitting rapid, decentralized transport of people, but also by permitting rapid decentralized distribution of food supplies throughout the expanded metropolitan districts that suburbs constitute. It has made extensive convenient parking space essential alike to the success of supermarkets and of baseball companies. It has added chauffeuring to the major responsibilities of the homemaker.

Meanwhile, automobiling has come to take around one eighth of total consumer expenditure, more than clothing and nearly half as much as eating. Automobiles are accused of undermining the nation's health, not only through an appalling rate of direct slaughter but also through relieving us of the need and opportunity for walking as a form of healthful exercise.

But automobiles are by no means the main factor in reducing physical exertion. In almost every type of gainful employment, and in household production likewise, machines have taken over the heavy part of the job. The consequences of our sedentary life show up in military alarm over the softness of our youth, and general concern with obesity as a national disease. "A plump wife and a full barn never did any man harm," is an old-country saying. Nowadays, the wife must have that slender look, and if the man is a farmer the contents of his barn had better be under CCC loan.

More subtle is the influence of technology on our whole pattern of interests. "The wonders of science in modern life" reflects an increasingly pervasive attitude that feeds on itself. In the midst of anxiety over what science is doing to our civilization we are fearful that we are not devoting enough of our human resources to it to keep ahead of international competition in scientific advance. So we have science-talent searches and national conferences on how to entice more of our youth into training for scientific and engineering pursuits. ("Science" in this context, I should note, does not usually include the social sciences.) Although most of us cannot be scientists, our standards of living require that we possess the increasing array of gadgets that science invents, and we must try to be at least pseudoscientific in our approaches to everything from flower gardening to child rearing.

I suspect two implications in this regarding our attitudes toward food. One is the increasing concern with nutrition. As I mentioned before, World War II gave great stimulus to our concern over nutritional inadequacies of the population. Since then advancing knowledge of nutritional science and its rapid popular dissemination have reinforced this concern. This has helped improve the nation's diet, and we seem to be on the verge of important new and far-reaching discoveries on the interrelationships of food and health.

The public seems avid to put such knowledge into practice almost faster than it is discovered. When the President of the United States suffered a heart attack recently, people followed breathlessly the newspaper accounts of his diagnosis and treatment. Casual mention that his breakfast included beef bacon caused a nationwide run on this healthful commodity in the stores. My only reservation about this attitude is that we may be too ready to accept dietary remedies, on the basis of inadequate knowledge, for health problems that derive primarily from other characteristics of modern living, such as the lack of physical exertion previously mentioned. We associate health with food rather than with automobiles.

From a marketing standpoint, does our concern with diet reduce the



status of food as something to be enjoyed for its own sake? Counting calories is becoming a national pastime. When most of us could, for the first time, luxuriously live to eat, has our attitude become one of eat to live?

Again, may nutritional association of particular foods with particular dietary needs reduce substitutability among foods? Do we believe that we must have milk, orange juice, and other health foods regardless of price?

A second possible implication of our scientific-mindedness for food marketing is preoccupation with the gadgetry of food preparation and service. One cannot cook properly today without an elaborate piece of equipment studded with knobs, dials, and colored lights to give fingertip control to the operation, plus a substantial array of subsidiary gadgets. This is true despite the fact that the process no longer starts with raw materials, but with semifinished goods ready to pop into the oven or the pan. Ralph Gould, in *Yankee Storekeeper*, mentions foods "getting to be of the three-minute kind—easy to prepare, easy to serve, easy to digest, easy to everything." Lower profit opportunities on these branded items, along with the decline in Sunday-dinner orders, persuaded him to shift from groceries to gasoline. I find myself wondering how much the interest in good eating, how much the housewife's pride in her cooking, has shifted towards pride in being proprietress of a scientifically equipped kitchen stocked with the latest scientific premixes, and what such a shift may mean for demand for food.

This, of course, is only one side of the story. Modern household labor-saving equipment has been an important factor in enabling the increasing number of housewives to take on gainful employment. The implications of women working on their attitudes toward food and their buying practices is a topic I should like to see studied more fully. Wives' working is, of course, an important source of higher family incomes. If my surmise is correct, additions to income from this source may have less effect in increasing the demand for food at the farm level, as distinct from demand for the marketing services of convenience in purchase and preparation, than correlations of time-series data might lead us to expect.

More generally, we would expect a corollary of higher income to be lower marginal utility of money, and hence a lower response to price—though as I shall suggest later in connection with the growth in installment credit, this may not fully apply to items like food that occupy a cash position in the budget. Also, I wonder whether some of us may have residual attitudes of thrift towards foods, as goods traditionally economized, that do not adhere to some newer types of goods and services to which no such tradition attaches.

A further implication of freer spending should be greater opportunity

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for quality appeal, though my later remarks may suggest some peculiar twists to this, also.

Finally, for the modern busy but well-financed housewife we should expect time to be more important to economize than dollars—time spent in food shopping, time spent in meal preparation, time spent in meal planning. This, of course, supports the much-argued thesis of "impulse buying." Actually, I question whether housewives are any more impulsive in their decision making than businessmen or farmers. All find it necessary to substitute accumulated experience for detailed study and analysis in countless decisions in order to get through them quickly and on to other things. For farmers we try to devise aids in making quick decisions wisely. Housewives need more of the same kind of help.

There are other facets of modern life which I should like to see studied from the standpoint of attitudes and motivations with respect to food consumption. Do the many and varied demands on time for organized activities—many of them disruptive to family meal schedules—lower the importance of eating as part of family living? With so many and varied alternative forms of entertainment available do we take less pleasure in our family meals? Is the return of larger families, with more children, increasing or decreasing the importance of family meals? What in general of the younger generation—are they learning to enjoy good eating? Or does the chief value of food to them reside in the box top?

Again, is having guests for dinner as prevalent as in times past, and is the meal served so important a focus of hospitality? My wife recently fell heir to two small notebooks, the record of meetings of the "Forget-me-not Circle," a housewives group to which her great-grandmother belonged. The women met Thursday afternoons at one another's homes. Entertainment varied from singing, story telling, dramatics and dancing to just chatting. But promptly at four o'clock the ladies adjourned for refreshments. I quote a typical menu: "Roast veal and dressing good enough for the queen, baked beans, beets, cream cake, and all other good things that belong to a Forget-me-not supper." After having "done ample justice" to such a midafternoon snack, the ladies repaired to their homes to prepare family dinner. What a contrast to the modern bridge tea—not to mention the coffee break!

There may still be such groups, but I do not know of them. These were women who took real pleasure in food, and who vied with each other for the status-value of setting the best table. I don't know what may have been the effect on their health—though several were grandmothers. But I wonder whether there are comparably important status-values built around food today, and what aspects of it they emphasize?

I should like in concluding to turn to the changes in marketing and

distribution that are associated with our changing patterns of living, and to the way they interact with our social attitudes and value patterns. In food marketing we are all familiar with revolutionary changes over the past couple of decades that reflect a combination of technological innovations in processing and distribution plus an adaptation to consumer desires: the rise of self-service supermarkets—a response to automobile shopping; the associated increase in consumer-packaged goods; the rise of frozen foods—dependent for their success upon wide availability of frozen-storage facilities in the home; and the proliferation of premixed, ready-to-cook, and precooked products.

Consumer credit is another development that deserves closer scrutiny than we have given it. In a period when other goods and services have been shifting to the easy-payment monthly-installment basis in the family budget, foods have been shifting away from credit to the cash-and-carry basis. Does this put them in the status of residual claimant upon income—recipients of what spending money is left when the fast-increasing volume of installment commitments has been met? If so, their market vulnerability, whenever incomes go down or even cease to rise, would seem greatly intensified. Local studies of this in areas of spot unemployment might furnish valuable information.

But the most striking development in marketing generally is the rapidly increasing importance of advertising and promotion. *Fortune* magazine estimates<sup>2</sup> that advertising alone cost close to ten billion dollars last year. This was three times the amount a decade earlier, a period in which gross national product only doubled. And media-advertising by itself probably accounts for a decreasing share of the total cost of modern integrated promotion.

David Potter, in his provocative lectures published under the title *People of Plenty*,<sup>3</sup> calls advertising “an institution of social control—an instrument comparable to the school and the church in the extent of its influence upon society.” To fortify this comparison he points out that we spend more on advertising than on primary and secondary education combined, and that the amount spent in 1951 was equivalent to \$36,000 for every clergyman supported by a church.

He considers it the institutionalization of our economic abundance. “In a society of abundance,” he argues, “the productive capacity can supply new kinds of goods faster than society in the mass learns to crave these goods or to regard them as necessities. If this new capacity is to be used, the imperative must fall upon consumption, and the society must be adjusted to a new set of drives and values in which consumption is para-

<sup>2</sup> September 1956 (Vol. 54, No. 3) p. 107.

<sup>3</sup> University of Chicago Press, 1954, Quotations from pp. 178, 175.

mount." The citizen of such a society must "be educated to perform his role as a consumer, . . . and the only institution which we have for instilling new needs, for training people to act as consumers, for altering men's values, and thus for hastening their adjustment to potential abundance is advertising. That is why it seems to me valid to regard advertising [I presume he would be willing to include here related practices of aggressive selling] as distinctively the institution of abundance."

Professor Potter is concerned primarily with noneconomic consequences of this, with its effects on our "national character." To the economist, its implication is that, in our abundant economy, the classical assumption of the insatiability of human wants no longer holds. Hence we find it necessary to devote an increasing proportion of resources to creating and stimulating wants. In this way we drive ourselves to work harder, increase our productivity and our income, and thus make ourselves susceptible to still greater buying pressures.

It is not surprising, then, that agricultural economists, concerned with marketing the abundant supplies of foods, find ourselves concerned with problems of promotion and consumer motivation. We are simply being caught up in the national whirl. But if we are to be involved in this game we need to go at it intelligently. We need to ask ourselves how foods stand in this national competition, whether they are gaining or losing ground, and whether the things being done are the best calculated increasingly to strengthen foods' long-run position.

I have remarked that the dominant technological interest in our society seems to feed on itself. Elizabeth Hoyt has pointed out that advertising intensifies this process: "If the merits of goods and services produced under machine industry, but not advertised, were left to stand or fall by themselves in competition with the products of nature and other goods and services not so produced, our bias would still be in favor of the machine goods. This is because we all believe so thoroughly in the advantages and merits of what machine industry can do for us and have had less opportunity to see the merits of others things. . . . But when the use of technological products is continually urged and even forced upon us by advertisers, how much greater our bias toward them becomes, how much more extensive is the part which they play in our culture."<sup>4</sup>

This seems to be true of much food advertising. In casual review of a handful of popular magazines I find three main appeals in the food ads. One is built around health and nutrition, including things you can get children to eat that will be good for them. Another is built around ease and speed of preparation, and assurance of results even though you are unskilled in cookery. These appeal to motives that I have previously

<sup>4</sup> *Consumption in Our Society*, McGraw-Hill, 1938, p. 99.

noted as concomitants of our science and technology. To play upon existing motives is, of course, a sound advertising approach. But I wonder if too exclusive reliance on these appeals would be best for the food business in the long run.

The third main appeal I find is to appetite, to the pleasure of eating. One would expect this to be the dominant motive to play on in advertising foods. A large proportion of ads emphasizing this appeal, however, were for condiments—magic ingredients for putting some flavor into otherwise tasteless foods.

This leads me to ponder the whole matter of food quality and people's interest in it. Among my friends I find two conflicting schools of thought. Some maintain that eating has not lost place as one of life's chief pleasures; rather that we have shifted interest from quantity to quality, and are developing a more aesthetic, more discriminating appreciation. Today's board groans less, but it is more tastefully and colorfully spread—as well as sounder nutritionally.

Others argue that mass production and mass distribution turn out bland products with all the flavor refined out of them. The object is to leave nothing that any potential consumer would *dislike*, so as to tap the widest possible market. The result is that there is nothing much left to *like* about the products, either. In a market that no longer offers any distinctiveness in foods, the only way to make them interesting is through condiments.

In their implications for marketing these views are perhaps less contradictory than they appear. Whichever side of the argument one takes, the question arises whether we are fully exploiting quality as a means of building interest in foods.

Do we need to reorient our ideas regarding quality from this standpoint? We associate quality chiefly with standardization of products according to uniform requirements of physical perfection—Grade A—and we have made great progress in improving food quality in these terms. Do we need now to give more emphasis to distinctiveness and variety—to qualities, rather than Quality?

I have in mind here the current fads for foreign cookery, gourmet societies, men's cooking, and backyard barbecuing as symptomatic of an interest that could be encouraged and built upon—an interest in "self-expression" through foods.

I am concerned also with the girl who grew up innocent of apple trees. How can she be stimulated and helped to acquire some of her farm grandmother's knowledge of apple varieties, their distinctive flavors and uses? If we should thus educate her could we make the varieties identifiably available to her in a market geared to mass distribution? Such things may have important implications for the future demand for foods



as the increased crop of war babies reach the age of setting up house-keeping for themselves in suburbia.

Again, we do a good deal of research on packaging as a merchandising device, and packaging is surely important for catching the buyer's eye. But for the long pull, do we need more attention to having distinctive products inside the packages, that will each build a devoted following of repeat buyers—although no one of them will capture the whole market?

In general, is the complaint of some of my friends justified that we have focused too much effort on developing the one product that the "average consumer" can be taught to "accept"? Would better strategy for the long pull be to recognize the dispersion of tastes and preferences among consumers, and to encourage, develop and cater to it as a means of maximizing sales?

Such an approach would require a longer-range research and promotional program. But something of the sort may be needed if we are, as Professor Potter says, to "educate people to their role as consumer" so that our abundant food-producing capacity can be more fully utilized. Those of us who like good food would think this truly education for higher standards of living.

I have suggested a number of questions I would like to see investigated by our researchers in consumer preferences and motivation all focusing around the place of food in the value patterns of our changing society, and how its position might be strengthened. Many other topics come readily to the imagination. There seems, for example, to be a revival of interest in participant as against spectator sports, and generally in hiking, camping, and similar outdoor recreations. Will this help divert our concern over health into working up a healthy appetite instead of counting calories? If so, would larger appropriations for public parks, forests, playgrounds, and similar recreational facilities be good for the food business?

My main thesis, however, is that we put relatively too much effort, in our merchandising and promotion, on devising gadgets that will get consumers to buy this bag of apples today—perhaps at the expense of pears or even of next week's apple purchases. A famous baseball manager insists that he only tries to win each day's game as it comes along. I have never believed him. I am confident that he looks also to the season's campaign and to next season's, too, if he has a continuing contract.

We, also, need a longer-range strategy. And basic to developing such a strategy is fundamental understanding of how the diverse threads in the pattern of modern living interweave to form our attitudes, motivations, and consumption practices relating to foods. This should be an explicit goal of our research.



## DISCUSSION: IMPLICATIONS OF CHANGING PATTERNS OF CONSUMPTION, PREFERENCES AND MOTIVATIONS

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In his paper Southworth makes early note of a few of the better-recognized factors affecting changes in motivations and preferences—income changes and shifts, population shifts and changes in structure, and others. As I perceive it, he then branches into his main subject of preferences and motivations associated with a technological culture. Such technological culture leads to a sedentary life and we become preoccupied with such things as the nutritional values of food instead of food as an enjoyment for its own sake. This technological culture leads to concern over gadgetry in food preparation where the gadgets are the goals, not the art of food preparation or the enjoyment of eating. The technological culture, he admits is time saving in the kitchen and, therefore, offers more time for other activities including gainful employment by the housewife, but these other activities in turn disrupt the enjoyment of food preparation and eating. This machine culture, with its ever increasing variety of new products, some nearly fully prepared for serving, introduced and sold to the public by an ever-increasing barrage of advertising and promotion, seems to be an absorbing game to the general public, though distasteful to the intellectual.

With all these distractions he hypothesizes that food is losing its place in the value patterns of our society. Implying the truth of the hypothesis as he does, the question is: how do we get food back as an end or goal in itself? This is the challenge. This is proposed as the objective of more marketing research. It could be a partial solution to policy problems through widening markets and absorbing surpluses.

The research proposals presumably would not involve that of widening the market for individual food products; they would involve food against all other products and services, playing upon both competitive and complementary relations of food with other products, services, recreation, etc. where applicable.

Many of us have heard Southworth expound briefly upon this theory or hypothesis before. Personally, I am pleased that he had the opportunity and took the opportunity to develop it more fully in this paper. It is thought provoking. It is quite original and in these days, when so many research objectives are developed to comply with the will of those with the purse strings or the whims of administrators, it is refreshing to hear of alternatives.

I hypothesize that the industrial revolution and the associated tech-

nological culture are here to stay, and that present trends are more likely to continue than to be reversed. Secondly, my impression of the research area proposed is that it is a most difficult one, involving a great deal of risk and uncertainty for the ones who undertake it, partly because it involves a broader background in the social sciences than most of us have.

The so-called technological culture has been growing upon us for more than 100 years. It has upset or remolded institution after institution as it progressed, family, shop, government, church, and all. Not only has the ordinary citizen liked it, but a high proportion of the intellectuals have aided and abetted it. It has been attractive to us, and people in foreign lands have accepted serious curtailment of numerous other goals to try to achieve it. Not only has it more nearly approached the goal of providing enough total goods and services to satisfy our basic wants, but it has provided numerous close substitutes from which one might select in order to help satisfy other desires.

Certainly Southworth is not the first to question whether it is good or bad. Philosophers and church leaders, among others, have done this for a century. But he probably is among the first to hypothesize that it is bad as far as disposing of an abundance of food products. By looking at an industrial economy as a whole, one must readily admit that it can afford to, and does, utilize a tremendous total amount of food-producing resources. The rapid growth of our own economy in the past 15 years has been accompanied by a fair rise in per capita food utilization maybe not in total pounds but in shifts to more resource-using foods or to more costly foods even at the farm level. There are people who hypothesize that folks in a technological culture eat themselves sick.

Admittedly Southworth makes no proposal to revert from an industrial economy to a subsistence economy. Then must we perceive a strong proposal to pierce one segment of the so-called technological culture via the kitchen, dining room, and food factory? To go back to grandmother's days here without major adjustments in all other segments of society seems most difficult. Husband's ulcers from pressures of business, doctor's orders to lose 10 pounds, quick breakfast, no one home for lunch, daughter's slim figure, shortage of school teachers, business men raiding each other for clerks and stenographers! Why should the housewife strive to achieve status, esteem, and enjoyment with food? Why not achieve it by kitchen gadgets she can show her neighbors, or by a good bridge hand, golf score, or her own pay check? Without piercing one segment we may not have removed the cause, and about all that is left is to encourage people to get more exercise, which was suggested in the paper. Doctors have long recommended this, and the additional voices of a few agricultural economists may not have much impact. My skepticism of potential results of

such research and possible activity does not preclude an interest in how it would be brought about. As suggested by Southworth here is an important research area. And even if we were not in the promotion business ourselves, it would be important to know more about causes of different types of behavior.

Here we get into a wide range of disciplines, likely more than economics and social psychology. Economists are used to handling prices and incomes and sometimes a few other variables such as age, education, risk, etc. as causes of behavior. These are only a few of the important ones. In our Michigan consumer panel we use income, size of family, age and education of housewives as explanatory variables, but typically we can explain only about 25 percent of the variation in purchases among families. For prediction and policy we need to do better than that. Apparently the other 75 percent is associated with such things as likes and dislikes, custom and habit, status, adventure, sex, hunger, exercise, rest, companionship, fear, shame, qualities of taste, smell and touch, living standards, availability, laws, advertising and promotion, and expectations, to name only a few. Maybe income, size of family, age and education of the housewife are not the most important motivators nor they may not reflect most motives. For prices and incomes we have some theory on their effect on buying behavior. For most of the above items my impression is that there are only numerous hypotheses scattered over the broad areas of the social and physical sciences.

This points out the research problem. We are all acquainted with the tremendous amount of resources which historically has gone into existing price theory and measurement. Is there any reason to believe that theory and measurement of any of the numerous others, whether status, sex, fear or any other will come any easier? To make it still more disturbing, many people believe some impulses for behavior arise from the unconscious mind. People do not know what they want. They cannot tell you what they want, although they may recognize it when they see, feel, or hear it.

Southworth's paper dealt primarily with *research and policy* implications of changing patterns of consumption, preferences, and motivations. With limited time and space he certainly was not able to develop fully either of these. There are many more policy implications and many more research implications. There are farm management and production adjustment implications as well as those of nutrition, marketing, foreign trade, and extension. Nor did he make an attempt to list or describe the many changes in consumption patterns, preferences, or motivations. The topic was overadequate in scope, and he should be commended for specifying and developing a more limited area.

## NEW METHODS OF MEASURING CONSUMER PREFERENCES AND MOTIVATION

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THE field of consumer survey research has seen numerous developments over the past five to ten years. They include nonverbal scaling, the increased use of experimental design procedures at the sales level, the application of sociometric techniques to trace personal influences, and many others. However, the major and most controversial development in the field has been the wholesale application of the tools of the clinical psychologist and the psychiatrist. Probably it is fair to assume that you are not avid readers of *Advertising Age*, *Tide*, *Printer's Ink*, and similar publications in which this development, popularly called "motivation research," has found its most vivid expression in arguments both pro and con, so I shall try to describe briefly what has been going on.

The progress of consumer survey research is seldom smooth. Something new appears. Great controversy is aroused. Too large claims are made for a new procedure. Unreasonable resistance appears. Only after a period of time does the new technique fit itself into the general body of research. This was true of sampling, for example. Certainly all of you remember the battles that were waged over area probability sampling. Now these valuable procedures, to which agricultural economists and statisticians contributed so much, are fully accepted and used routinely in market research. The same is likely to be true of many of the techniques employed in so-called "motivation research."

The purpose of motivation research is to get behind overt behavior, to understand why people choose *this* instead of *that*. A person needs only limited experience in questionnaire-type surveys to realize that many areas of inquiry are not amenable to exploration by direct questions. Many important motives and reasons for choice are of a kind that the consumer *will not* describe because a truthful description would be damaging to his ego. Others he *cannot* describe, either because he himself does not have the words to make his meaning clear or because his motive exists below the level of awareness. Very often such motives are of paramount importance in consumer behavior. If one tries to inquire into them with direct questions, especially categorical questions, one tends to get replies that are either useless or dangerously misleading.

Perhaps a classic example is in the field of automobile design. One major manufacturer apparently took seriously replies to direct questions as to what the consumer finds most desirable in an automobile and produced a vehicle that was sensible, economical to run, had little trim, and



was boxy in appearance. The net result was a major loss of business in one year. Certainly when people are asked what they desire in an automobile they want to appear to be sensible, logical people, so they give sensible, logical answers—in spite of the fact that their real basis for choice is centered around such motives as status-striving and aggressiveness. The car they really want and the car they really buy is one with style and lots of power. Proper use of up-to-date research procedures designed to get behind choosing behavior would have avoided this costly error. Similar examples could be supplied for a great variety of consumer products and services.

What are some of these procedures that are being used to get answers in areas in which consumers either will not or cannot verbalize in response to the usual direct question? One of them is intensive interviewing, combined with content analysis. It is an outgrowth of the procedures used in the clinical interview and must be conducted by a specially trained person who has been taught to use nondirective probes, to follow up productive leads—in short, to do all of the kinds of things that a regular field interviewer must *never* do. Usually, what we have called the “funnel” approach is used. The interviewer is provided with an outline of topics to discuss, and the outline proceeds from the most general to the most specific (therefore, the name “funnel”). This general-to-specific approach permits a topic to be explored fully, without causing the respondent to focus on specific topics too early in the interview. The interviews are generally either machine recorded or taken down as nearly verbatim as possible by the interviewer. The resulting protocols are then analyzed—usually by a psychologist—in much the same way as clinical interviews are analyzed. Special attention is paid to emotionally loaded words, to denials of motives, to the attributing of motives to others, and so forth. Ways of categorizing such responses are worked out, making frequency tabulation possible.

Projective techniques of various kinds are also being used very extensively. Of course, projective attitude assessment devices are not at all new. It is only their increased application in the consumer research field that is new. They stem from the projective devices used in the clinical and personality psychology areas. Perhaps the best known of the clinical-projective devices used in the clinical field are the Rorschach Ink Blot Test and the Thematic Apperception Test (the T.A.T.). In the first of these the subject is presented with a series of ink blot forms that do not represent anything in particular and is asked to state what he sees in them. The particular organizations which the subject imposes on these essentially unstructured forms tend to reveal the subject's underlying personality structure. The Thematic Apperception Test consists of a group of extremely ambiguous pictures that contain only the vaguest



clues as to setting and the ages, sexes, and behavior of the people depicted. The clinical subject is asked to tell a story about each picture, and because of the paucity of clues in the pictures he must call upon his experience and imagination in a way that is generally very revealing to the clinician. The theory behind such devices, stated in rather over-simplified form, is that when a person is asked to structure or organize an essentially unstructured or ambiguous situation he can do so only by calling upon and revealing his own personality or attitudinal structure.

So far as I know, standardized clinical projective devices are not being used in research on consumer preferences and motives, except, perhaps, in a very few instances. What is being used is a variety of devices, each tailor-made to the particular product and research task. These devices show promise of being useful in the following ways:

1. A properly constructed projective device should do a good job of measuring attitudes without distorting or destroying them in the process of measurement. In theory, this would often give them greater validity than direct questions, in the sense that they would be more accurate as predictors of other types of behavior (e.g., product choice).
2. Many of them permit measurement of attitude without the respondent's awareness that his attitude is being measured. The concealment thus provided can be extremely useful in touchy areas where people either consciously or unconsciously reject the idea of revealing their attitudes to the interviewer.
3. Most projective devices do not ask an individual to verbalize or assess his own attitude, but merely provide situations in which the attitudes are elicited in functional ways. Thus, assessment of attitudes that are functional but un verbalized or unconscious becomes possible.

Let us explore examples of projective procedures commonly used in consumer research. Perhaps the most commonly used is the picture-story procedure—an outgrowth of Murray's Thematic Apperception Test. Suppose one wanted to inquire into the decision processes involved in buying a new tractor. One might have an artist draw a picture, as unstructured as possible, showing just barely enough detail to suggest the scene as a farm-machinery establishment, in which a man and woman and a salesman of no particular ages or economic levels are looking at a tractor of no particular make or model. Pretesting would be done to make sure that the picture was otherwise ambiguous, that no more was being presented. Probably a half dozen or more redrawings of the picture would be necessary.

As finally used, the picture would be presented to a farmer and he

would be asked such questions as: "What is going on here?" "What led up to this?" "What is the woman saying?" "What does she really think?" "What is this man saying?" "What does he really think?" "What is the outcome?" "Why do you suppose it happens that way?" In the course of answering such a series of questions about a picture in which there are no real clues, the respondent reveals underlying motives, attitudes, sources of influence, and so forth, that are almost impossible to obtain by a more direct approach. Again, the administration of the questionnaire and analysis of the results require especially-trained people.

Also used extensively is the sentence completion technique. Suppose one is interested in margarine as compared to butter. One might compose such incomplete sentences as: "A housewife who serves margarine at a dinner party. . . ." "The food value of margarine is. . . ." "The family that uses margarine instead of butter is. . . ." Respondents are then asked to complete such sentences and analysis is made of the contents of the completions. If the area is a particularly touchy one, the series of sentences is usually begun with a few innocuous and easy-to-complete sentences, in order to make the task easier for the respondent.

Word association is also used. Key words associated with the product or service of interest are listed, as well as a number of unrelated innocuous words which provide concealment and make responses easier. The task of the respondent is simply to say the first words that come to mind after the interviewer has said a test word. The responses are written down and analyzed for attitudinal meaning. For example, in a study of liquor purchasing key words might be "alcohol," "mixed drink," "drunkenness," "decanter," "booze," etc.

As we turn from the projective devices, group interviewing is also a useful means of exploring with greater depth the area of consumer choice and motivation. The group interview is almost always machine recorded or taken down verbatim by a stenotypist. Generally, a machine recording is better because in the analysis such things as pauses, manner of speaking, and other clues are of great importance. The various ways in which group interviews may be conducted are almost innumerable and must be adapted to the problem at hand. Sometimes it consists of a guided discussion with argument encouraged, and other times participants may be required to spontaneously act out roles in a play, composing the lines extemporaneously. For example, one may set the situation as that of buying a dishwasher. Some participants are assigned roles of husband, wife, teenage child, and so forth, and others are asked to evaluate and criticize the ways in which the roles are carried out. Careful attention is generally paid to the compositions of the groups as to age, sex, socioeconomic status, and the like. The main value of such group procedures

is that the unrehearsed interplay between participants touches off extremely revealing comments and points of view.

Many other techniques are used, but I believe I have described enough to give you the flavor of what is being done. The use of such procedures has caused considerable furor and heated debate in market research. Perhaps one reason for this is that it places many old-time market researchers on unfamiliar ground and makes them wonder about their own places in the future. But an equal amount of the uproar is touched off, I believe, by many practitioners of so-called "motivation research" who make too-broad claims for what they are doing, misuse methods, misuse standardized clinical terms, and make use of unfamiliar Freudian terminology and even just plain gobbledygook.

For example, some motivation researchers state that they are uncovering such basic aspects of human behavior that the need for scientific sampling has been eliminated and that valid conclusions can be drawn from small judgmentally-selected groups of people.

Many of them, also, claim that they are using "depth" interviewing. Depth interviewing is a psychoanalytic term which refers to an interview conducted for one or two hours a week over a period of from two to five years. Clearly, motivation researchers are using the term, but not the procedure. The most they are doing—perhaps with some exceptions that I have not heard about—is intensive interviewing, as described above.

Many of them, also, say they are using Thematic Apperception Tests. The Murray Thematic Apperception Test is a standardized clinical projective device that takes hours to administer and many, many hours to interpret. Also, the results have only the remotest sort of connection with matters of interest to consumer researchers. Motivation researchers are not using Thematic Apperception Tests but picture-story procedures, as described above.

The Freudian terminology they employ is probably used in all honesty by some, but I strongly suspect that in many instances it is designed to confuse, to mystify and to help sell to the unsophisticated. The resentment it has aroused in many quarters is typified by the following quotation from *Advertising Age*.

"Double-dome professors, and crystal gazers are probing the minds of buyers. They are attempting to prove that sales are controlled by the libido or that people buy merchandise because subconsciously they hate their fathers. Of course, they've cooked up a fancy name to intrigue the ordinarily hard-headed businessman with their light-headed fancy. They call their invasion of the advertising and merchandising field motivation research."<sup>1</sup>

<sup>1</sup>Dean Wittenberg, director of marketing of Pabst Brewing Co., *Advertising Age*, February 13, 1956.

The result of such unfortunate practices has been that realistic evaluation of the pros and cons of these attempts to secure deeper insight into the reasons for consumer behavior has been made extremely difficult. People have taken sides. They tend either to completely reject the whole idea or to go completely overboard for it. However, the dust has settled enough that a realistic appraisal is possible.

It seems clear now that too much has been claimed by too many—but that there also has been made a solid contribution which can be valuable if used properly. How should it be used? In the first place, it should not be used as a substitute for scientific sample surveys. Its maximum value lies in the development of hypotheses and the creation of new methods for use in a final field study. Motivation research has not eliminated the need for controlled interviewing in order to eliminate interviewer bias as nearly as possible, or the need for determining the distribution in the population of the variables under study.

We at National Analysts do not like the term, "motivation research." We use the procedures I have described to explore, at the beginning of the study, as deeply as possible the factors that are involved in consumer behavior. It is important to recognize the limitations of these new techniques. They are especially vulnerable to experimental bias and interpretative error and, not only that, they almost always employ small samples because of the high cost per-interview involved. Therefore, the results of such work never should be treated as more than hypotheses to be tested in a regular sample survey.

The procedures can also contribute to the methods used in the final field phase. For example, people may not be able to tell you, in answer to a direct question, what stereotyped opinion they have concerning the young farmer just out of agricultural school—but, if provided with a checklist of adjectives, they probably can give you the necessary information. Intensive techniques used in the exploratory phase can provide the adjectives for the checklist. Similarly, such developmental or exploratory work can reveal the categories of response that should be used in a closed-category question, and it can reveal the kinds of words and phrases that are used by consumers in talking about a product. Occasionally it is even possible to employ some of the indirect or projective techniques in simplified form in a full-scale sample survey. We have done so in several instances; for example, in a gasoline study, in a resilient-flooring study and in a study of a proposed new item of farm machinery.

There can be little doubt that the introduction of such procedures has added to the complexity and difficulty of consumer survey work. Staffing is not the least of the problems. If the techniques are to be employed with maximum advantage, qualified people with training in their use



must be employed to direct such work. In addition, if the work reaches any considerable volume a special corps of developmental interviewers, especially trained to handle these newer techniques, must be created. If these precautions are not taken, results can be worse than worthless—they can be misleading.

Another difficulty is that such work leads to more complicated questionnaires—thus making a tougher job for the regular field interviewers. Usually a questionnaire that has been created on the basis of intensive developmental work has a higher proportion of open-end questions than is usually the case, contains a certain amount of unfamiliar procedure, and may be of a nature that makes it harder for the interviewer to establish rapport with the respondent. Too much of this can injure interviewer morale, with consequent negative effects on completion rates and on interviewer turnover. Therefore, one should proceed slowly and, wherever possible, accompany any increase in questionnaire complexity with further interviewer training.

This more complex work also requires a more time-consuming and complex data processing job. The higher percentage of open-end questions makes more of a coding job, and the subtle nature of some of the questions makes coding harder and increases the aptitude and training requirements for coding personnel. Also, a more complex cross-classification of data is usually required. This adds to tabulating costs and reporting costs.

Finally, the nature of the reports usually resulting from such studies is far more analytic than a simple exposition of the data, and requires highly skilled personnel with strong backgrounds in both theory and methods.

The net result of all this is that studies take longer and cost more. In spite of this increased time and cost, the trend is definitely in the direction of greater use of this more intensive research. Companies have found that it pays off in advertising themes, media choice, product design, dealer practices, packaging and other areas where an accurate and penetrating knowledge of consumer preferences and motives can be capitalized on with practical action. We at National Analysts are in a particularly good position to observe this trend. Five years ago, at least 90% of our work in the consumer survey field was of the direct question and enumerative type. Now, 50 to 60 per cent of our research involves at least some of these more intensive procedures at some stage. The trend has not been as strong in the agricultural research as it has been in the area of manufactured consumer products, but agricultural research is being affected, too. In recent months we have conducted studies involving these procedures on fertilizer, farm machinery and certain new



products for farms, and expect to have a higher percentage of our agricultural research go in that direction in the future.

I think this new development in studying consumer preferences and motives will have a major impact on research and result in knowledge concerning farmers as consumers and concerning the consumers of farm products. These new techniques will not in any way replace the large body of techniques already available. They are valuable mainly as means of creating better hypotheses and better questionnaires. They will not revolutionize consumer research, but they will make a solid and lasting contribution.

### DISCUSSION: NEW METHODS OF MEASURING CONSUMER PREFERENCES AND MOTIVATION

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Agricultural economists are becoming more-and-more aware of the significance of the fact that consumer demand is a function of both the ability to buy and the willingness to buy. Our favorite statistical methods and statistical series are generally reliable for analysis of consumers' ability to buy in terms of current income, but are less satisfactory for taking account of changes in assets and the ability to borrow money. To analyze consumers' willingness to buy we need the findings of the more familiar types of market surveys and the new methods of measuring consumer preferences and motivation.

Recently, I have been measuring the effect of major economic factors on the increase in the total market value of food consumed in the U. S. from \$21 billion in 1941 to about \$61 billion in 1955. About \$12 billion of this increase was for more food and marketing services and \$28 billion for higher prices, both the rise in the general price level and higher prices to get more food and services. That \$12 billion, or \$11.8 billion (in 1941 prices) to be more exact, was subdivided into \$2.8 billion for more food (in terms of productive resources, not pounds) and \$9 billion for more services. Using Engel curves (market value of food per person plotted against disposable money income per person) and income distributions based on spring 1942 and 1955 survey data, I found that changes in income (combined with the population increase) accounted for \$5.3 billion of the \$11.8 billion—divided about equally between more food and more food marketing services. But higher levels for the relationship of food use to real income resulted in an even greater increase of \$6.5 billion in the market value of food—practically all of it for marketing

services. This highlights the need for "why" research—why have American consumers changed their level of demand for food marketing services and not for the food commodities as produced by farmers?

So we agricultural economists have urgent need for the application of the new methods of measuring consumer preferences and motivation described so clearly and comprehensively by Mr. Kilpatrick. His paper has encouraging aspects but some discouraging ones too. It has provided us with a clear-cut description of what these methods are and a tempered appraisal of what they can and cannot be used for. We need both the more familiar nose-counting type of consumer survey and these newer methods, plus our usual statistical techniques, as we try to understand why the demand for farm products has stayed close to expectations on the basis of income and urbanization changes, whereas the demand for marketing services has exceeded all expectations.

But I must confess to some discouragement. I for one have been struggling for some years to learn the language of the econometricians so as to be able to judge what they do with food figures. Now here come the psychologists into my area of research with even more complicated ideas—and such an esoteric vocabulary! And I only had one psychology course in college.

A real advantage of being a discussant is that one has the opportunity to study at least one paper before coming to this meeting and so can appear to be unusually well informed—or is it, well read? Despite my boning up on this subject, I have some unanswered questions which I hope Mr. Kilpatrick can be given time to discuss:

1. How do researchers using these new methods of measuring consumer preferences and motivation work into their predictions the effects of income and of urbanization, and the pressures of fixed obligations such as installment payments?

2. How often do these methods lead to facts that we did not know before? Or are they most helpful in extending our understanding of known facts?

3. How does he test hypotheses derived through use of projective techniques? I have read some comments by Darrell Lucas on the subject of the unreliability of the Rorschach and T.A.T. tests, even when applied by experienced clinical psychologists. If one develops hypotheses only from intensive interviewing, for example, how can these be tested in scientific sample surveys without just repeating the small intensive study on a larger scale?

4. How does he measure the relative significance of attitudes believed to be important, i.e. their frequency by social or economic strata?

5. In view of the problems we have experienced with forecasting con-

sumption of individual foods more than a few years ahead, I wonder if National Analysts has accumulated information about how far ahead they can predict attitudes basic to consumer demand?

Although Kilpatrick and my colleague, Trienah Meyers, agree that much of so-called motivation research is not really so new, I believe that many agricultural economists have had only vague ideas of their methods and, perhaps more important, of the newer ideas of modern psychology and sociology. We have desperate need of both their theories and their methods (1) to help us understand why some patterns of food consumption are changing and why others are not, (2) to improve our outlook forecasts and (3) to help specialists in market development and in consumer education to change consumption patterns and thereby to make those forecasts come out *wrong*.

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# ADJUSTING AGRICULTURE TO ECONOMIC GROWTH

Chairman: O. R. Johnson, University of Missouri

## THE ROLE OF PRODUCTION ECONOMICS IN THE PROBLEM OF AGRICULTURAL ADJUSTMENT<sup>1</sup>

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IN THIS paper I use the term "production economics" in the broad sense—to include all professional economic activities devoted to the solution of economic problems of agricultural production. Research, teaching, extension, and other work of a professional nature in the fields usually labeled farm management, land economics, agricultural finance, or other subdivisions, are included in the general field. I recognize the need for close cooperation with workers in prices and marketing as well as with the natural scientists and engineers, whose work also is essential to the solution of economic problems of production. Although I do not go into details on work in the latter fields, I want to emphasize the need for teamwork, if problems are to be tackled and solved in ways that facilitate the use of results.

Some of the discussion necessarily involves value judgments. I have tried to include warning signals where subjective valuations are not readily apparent.

### *The Agricultural Adjustment Problem*

The existence of a major agricultural adjustment problem in a rapidly growing economy is recognized in the title assigned to this paper. Despite general economic expansion, markets for farm products have not kept pace with output in recent years. Perhaps we can see the scope of the problem more clearly if we try to visualize a situation that would constitute better balance in farm production in relation to available markets, and that would provide improved income opportunities for farm people.

1. Production of farm products geared closely enough to market demand to eliminate *chronic surplus conditions* both in total output and in the different farm commodities.
2. Sufficient flexibility in production to permit shifts in output in response to changes in production and marketing conditions so as to prevent development of future surplus situations.
3. Price and cost relationships that would provide income and family living opportunities in farming comparable to those available in other occupations for similar effort, skill, and managerial ability.

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<sup>1</sup>This paper expresses the writer's personal views on the questions considered.

Suppose we compare present conditions with the more or less ideal situation outlined above:

1. Total farm output in 1956 was some 5 to 8 percent above market outlets at prevailing prices, even when some of the special disposal programs were included as markets. Although farm output in 1957 is likely to be somewhat lower, current output is outpacing markets despite major efforts to restrict production.
2. Chronic surplus conditions exist in some of our major commodities, especially wheat, cotton, tobacco, and manufactured dairy products.
3. Incomes in farming are low in relation to other occupations.<sup>2</sup> Here we must differentiate between disparities of long standing and those of more recent origin. Although available time series computed from aggregate data show persistent disparity between farm and nonfarm incomes, part of the disparity arises from the difficulty of comparing incomes of different occupational groups. But farm people have experienced wide fluctuations in their relative income position. "Real income" per farmworker rose rapidly in the war and rehabilitation years. This was followed by a postwar decline which continued through 1955 and was halted by a slight recovery in 1956. In the years 1953-55, "real income" per farmworker averaged 11 percent below the years 1947-49, whereas "real income" per employed factory worker increased 21 percent.<sup>3</sup>
4. Level-of-living measures, other than income, have shown considerable improvement since 1940, but in comparison with nonfarm groups they are still unfavorable. For example, farm operators as well as hired laborers work longer hours per day and per week; and education, health, and housing compare unfavorably with urban areas.<sup>4</sup>

<sup>2</sup>The difficulties inherent in comparing incomes of farm workers with incomes in other occupations are recognized. The available over-all comparisons probably over-emphasize the disparity, but the preliminary estimate of per capita income to persons on farms in 1956 was \$902 compared with per capita income of \$2,018 to the non-farm population. If we attempt to estimate net income per hour of farmwork after deducting a return on the farm investment at going rates, we arrive at average earnings per hour in 1956 of 75 to 80 cents. However, return per hour to operator and family labor (after deducting interest on current investment) varies a great deal by types, sizes, and location of farms. In 1956, average returns per hour on 28 different types of family-operated farms located in some of the major farming areas ranged as follows:

Average returns per hour	No. of farm types
Minus return	6
Under 50¢ per hour	7
50¢ to 74¢ per hour	6
75¢ to \$1.00 per hour	4
Over \$1.00 per hour	5

<sup>3</sup>See "Technological Research and Education in Relation to Economic Progress," presented by Sherman E. Johnson and Glen T. Barton at the Conference on Adjusting Commercial Agriculture to Economic Growth, Chicago, Ill., March 18-19, 1957.

<sup>4</sup>Census reports on the labor force indicate that persons at work in agriculture averaged 46.3 hours per week in 1956, whereas those working in nonagricultural industries averaged 40.9 hours. One might speculate concerning the probable reduction in farm output if the farm workweek were shortened by 13 percent.



Both the recent unfavorable income trends and the disparities of long standing must be overcome, if income and family living opportunities in farming are to compare favorably with other occupations. This paper, however, is concerned mainly with the maladjustments that have developed in recent years. And attention is centered largely on commercial family farms.

Why do we find serious unbalance in the farm sector at a time of record prosperity in most other sectors of the economy? Not because farmers as a group are operating inefficiently. Progress in *physical efficiency* has been excellent in recent years with the exception of some isolated farming areas. Farm people, however, have not shared fully in the benefits of their technical efficiency. But question: Should they expect more for their services than the market will pay for their output under conditions of full employment and prosperity? That question prompts still another. In view of the inelastic demand for farm products, what would the market pay if production were geared more closely to demand under present economic conditions?

This brings us back to the reasons why we have excess output. Our usual explanation is that too many resources are devoted to farm production. But farm people make the decisions concerning use of land and other capital resources in farming. They also make the decisions as to whether to stay in farming or to shift into other occupations. Why do so many stay on the farm when better income opportunities are available elsewhere? Why do they buy or rent land and commit other capital resources to increase output under present conditions? Do the non-economic attractions in farming outweigh income comparisons? Or is it lack of knowledge of other opportunities, or inability to shift without incurring heavy losses?

Unfortunately, available information does not provide unchallengeable answers to these questions. Perhaps some clues can be found in what happened before the recent drop in farm incomes. Farming was profitable during the war and rehabilitation years of the 1940's. Farmers gained in relative income position at that time. A leveling off in 1948 and 1949 was succeeded by another spurt following the Korean crisis. Large investments were made to increase output during those years. Farming was not overexpanded for the market that then prevailed. The early rehabilitation years and the Korean crisis placed special emphasis on wheat and cotton, which are now in the chronic surplus category. The investments made for expansion in those years are now fixed costs. Severe losses would be encountered if they were liquidated; consequently, these resources are continued in production.

GI training programs gave on-farm training to nearly 700,000 veterans

of World War II. Information is not available as to the number who remained in farming, but those who got started in 1947 and 1948 find themselves 9 or 10 years older today. Most of them are now between 35 and 45 years old. With growing families, they find it extremely difficult to shift to other occupations.<sup>5</sup>

Many farmers who got started in the late 1940's or perhaps in the early 1950's are now struggling for financial survival. They are utilizing their labor and their fixed plant to produce as much income as possible. And even farmers who are operating under financial pressure can adopt some output-increasing techniques, such as more lime and fertilizer.<sup>6</sup>

At the other extreme are the farmers who were able to build up financial reserves during the relatively high-income years. They can adopt new cost-reducing techniques even if heavy investments are involved. Many nonfarmer owners of land also are in a position to make cost-reducing improvements. Consequently, some improvements have been made which involve new fixed investments, such as supplemental irrigation in humid areas.

The creeping inflation in the prices of materials and services bought by farmers, however, now severely limits opportunities for increasing net income by reducing costs, even by those who can afford the necessary investment. And because these improvements usually result in increased output, and eventually lower prices, farmers as a group retain relatively little of the benefits of technical efficiency when production is outpacing available markets.<sup>7</sup> The impact of lower prices is reflected in lower incomes to the farm-operator family. On the other hand, wages of hired farmworkers increase because of work opportunities in nonfarm employment. Ordinarily we would expect lower farm prices to be reflected in lower land values, but land values have risen and are now 47 percent above the 1947-49 levels.

### *Let-Alone Theory of Agricultural Adjustment*

The available evidence indicates that major adjustments are required to achieve a prosperous peacetime agriculture. Do production economists have some responsibility for aiding the transition? Our answers no doubt will vary according to the theory that we hold concerning the process

<sup>5</sup> There has been a rapid migration from farms in recent years despite impediments to shifting occupations. Farm population decreased about 3 million from 1950 to 1954, and the number of farms enumerated by the census in 1954 was 600,000 less than in 1950.

<sup>6</sup> When acreage allotment programs are in effect, farmers attempt to maximize yields on the allotted acres, and to grow other crops on the diverted acres.

<sup>7</sup> The benefits tend to be shifted to other groups, but the Nation as a whole usually benefits from gains in technical efficiency. See reference in footnote 3.

of adjustment. If we subscribe to a *let-alone theory of adjustment*, we assume that without aid or interference, farm output eventually will come into balance with available markets. In other words, given time, farmers acting in their own interests will adjust production to achieve balance.

This theory follows the classical argument that income pressure is necessary to balance output with markets; also that incomes have to be lower in agriculture than in other occupations in order to induce people to leave farm employment. If balance is to be achieved in this way, income pressure has to be sufficient to induce enough farm people to shift to other occupations to offset (1) the higher replacement rates in agriculture, (2) the present maladjustment in production, and (3) the effects of output-increasing technology.

Few production economists today subscribe to this theory in its pure form.<sup>8</sup> Those who lean in that direction, however, probably would say that the role of production economics in the present situation should involve research and extension activities to inform individual farmers concerning profitable organization and operation of farms, improved tenure relations, and use of credit, outlook, and other information that will enable them to survive the competitive struggle. Even if production economics is limited to those activities, considerable expansion of effort would be required to do the job effectively in all areas.

But production economists cannot be confident about the efficacy of this theory until they have analyzed what the consequences would be if it were put into practice. The following questions require answers:

1. How far would net farm income have to decline below present levels, and for how long would the lower level have to prevail in order to achieve balance in relation to markets?
2. Would the necessary income pressure be tolerated by farmers and by the public generally? If so, would the squeezing-out process involve soil depletion, rundown farms, and children growing up without adequate attention to health and education?
3. How many farm people would have to shift out of agriculture in order to achieve prosperity for those who remained on farms? We have had rapid out-migration in recent years. What acceleration would be needed?
4. Would the process shift out of agriculture those who are likely to find their best income alternatives in other occupations, or would it leave agricultural "islands" of stranded people with low incomes in agriculture?
5. How would the resulting structure of agriculture conform to the goals of farm people and to national interests in agriculture? How many full-time farms would we have as a result of such adjustments? What would be the farm-size pattern? Would we have a considerable increase in large-

<sup>8</sup> Perhaps a somewhat larger group would subscribe to a mild form of "assisted laissez faire," but would rely on income pressure to accomplish most of the needed adjustment.

scale farms dependent on hired farmworkers? Would most of the farms be owner operated, or would tenancy increase?

Answers to such questions would require considerable research in fields that are not well cultivated at the present time.

### *Public-Interest Theory of Adjustment*

Perhaps most production economists would subscribe to some form of a *public-interest theory of agricultural adjustment*. Although they may vary in their opinions as to the form and the quantity of public programs that should be undertaken to facilitate agricultural adjustment, they favor a positive approach to improvement of income opportunities for farm people, either on or off the farm. A vigorous formulation of this theory involves acceptance of two major premises that run about as follows:

1. *The nation needs a prosperous as well as an efficient agriculture.* Income improvement is necessary because only a prosperous agriculture can be equipped to meet unforeseen emergency demands either at home or abroad. Continued emphasis on efficient production of food and fiber is desirable, but more attention should be given to flexibility in production and to elimination of chronic surpluses.<sup>9</sup> However, the margin between scarcity and overabundance is relatively narrow. Either international emergency or serious drought could upset the balance. Therefore, reserve capacity is needed to provide insurance against disaster. We need also to protect our land and water resources against irreparable damage in the interest of continued progress of our society. Many people would add that we need a prosperous agriculture in the interest of stability of our democracy.

2. *Farm people should have some protection against major natural and economic hazards that are beyond their control as individuals.* The major changes in the farm environment that are outside the control of individual farmers are (a) the physical hazards of weather, and disease and insect damage to crops and livestock, (b) important technical changes, and (c) major swings in prices and costs.

Some would say that acceptance of the second premise means abandonment of the profit-and-loss system which is essential to operation of a free enterprise economy. But farmers would not be protected from the folly of their own actions; only against the effects of forces which they as individuals cannot control. Protection of this type is now available to most other groups in our society, either through direct public participa-

<sup>9</sup> Technical progress in agriculture has contributed immensely to general public welfare. The benefits received by other groups frequently are not mentioned in discussions of public investments for agricultural improvement.

tion, or through group bargaining with public sanction. This type of protection recognizes that public action may be necessary to prevent extreme disparities of income; also that the way in which adjustment is achieved will determine largely the structure of agriculture in the years ahead.

Acceptance of these two premises requires consideration of programs that will aid farmers in overcoming maladjustments and help prevent their recurrence.<sup>10</sup> Such programs require public investment in agriculture. In this connection, we might observe that publicly supported research, teaching, and extension are public investments just as much as other agricultural programs. Investments in research and education must be continued if agriculture is to keep in step with progress in other industries, and especially with the industries producing goods competing with farm products as sources of raw materials. Also, farmers in this country cannot afford to lag behind technical progress in other countries.

Under a public-interest theory of adjustment, it is essential to recognize, however, that research and education should include analyses of the impacts of technical and economic changes on different groups of farm people; and that suggested ways of cushioning the shock of major adjustments should be developed. So far, these phases of research and education have not been emphasized.

It is necessary to maintain some reserve capacity in order to meet possible unforeseen demands. How fortunate we were that agriculture did have reserve capacity at the outbreak of World War III! In a sense, reserve capacity constitutes a national insurance policy for the benefit of all of us as citizens. But question: Should farmers pay the entire premium cost for such insurance, or should we devise ways of compensating farmers for maintaining reserve resources?<sup>11</sup>

Conservation of soil and water resources, and reserve capacity to meet unforeseen as well as long-term needs are part and parcel of the adjustment problem. In the present period of overabundance, is it possible to devise ways of shifting a part of the stream of production from the present to the future? In other words, *can we harmonize conservation and adjustment?*

Protection against natural hazards such as crop failure will require further development of insurance principles. For example, we need to discover whether crop insurance can be made self-sustaining in some of our hazardous farming areas. Perhaps long-term contracts could be

<sup>10</sup> The need for adjustment programs is recognized in current legislation, but the programs now in effect had their origins in the 1930's when the problems were quite different.

<sup>11</sup> The conservation reserve program might be considered as a step toward compensating farmers for maintaining reserve capacity.



developed that would cover both the ups and downs of the weather cycle.

Protection against economic hazards requires development of rational adjustment and income support programs. Such programs should avoid subsidizing outmoded production. They should be designed to facilitate shifts in the direction of nationally desirable adjustments by making such shifts profitable to individual farmers who, after all, must accomplish the adjustment.

Public investments of the type mentioned would need to be pointed toward aiding establishment of an environment that would provide income and living opportunities in farming similar to those available for the same skill, effort, and managerial ability in other occupations. Intelligent programs also could facilitate changes in the structure of agriculture that would promote the interests of farm people as well as the general public.

It is evident that those who accept a public-interest theory of adjustment will visualize a much larger role for production economics than will those who accept the let-alone theory, although some of the same ground would be covered under either theory. Both theories call for additional research on problems of individual farmers, and some of the same questions with respect to the probable effects of adjustments would have to be answered.

### *Gaps in Our Information*

When we consider types of information required to tackle intelligently the agricultural adjustment problem we discover serious gaps. The remainder of this paper is devoted to outlining the gaps in our information that need to be filled if production economics is to play a significant role in agricultural adjustment. Some of these gaps were indicated in discussion of the let-alone theory. Much of the following information would be needed even if that theory were accepted, and it constitutes essential background for programs of ameliorative action:

1. Appraisal of opportunities for adjusting farming to prospective markets. This involves a continuing appraisal of adjustment opportunities in major farming areas. I shall not go into details concerning the efforts needed to obtain information of this type. A suggested cooperative Land Grant College and Department study involving continuing appraisal of adjustment problems has been under discussion during the past year.<sup>12</sup>

<sup>12</sup> An outline, entitled "Appraisal of Opportunities for Adjusting Farming to Prospective Markets," has been discussed with experiment station directors and with regional groups of production economists. There has been a great deal of discussion in recent months concerning the need for research of this type. Iowa State College recently created a center for agricultural adjustments.

In summary, a continuing nationwide appraisal would involve the following steps:

- (a) A framework, or projection model, of potential market demands and of potential production, considering both technical and economic changes.<sup>13</sup>
- (b) *Continuing studies* in all major farming areas to analyze desirable adjustments, including opportunities for cost reduction, and to estimate "probable production" in each area as a result of projected changes.
- (c) Interrelated aggregative analyses based on area and aggregative estimates of production for comparison with prospective demand projections.
- (d) Modifications of original area suggestions needed to achieve balance.<sup>14</sup>

A nationwide study of this type would indicate the production changes needed to achieve balance with prospective markets—in aggregate output, and for different enterprises. It also would appraise opportunities for shifting production into the most promising lines on representative farms, area by area. Occasional national summaries then would indicate how closely suggested adjustments would be likely to gear into available markets. The resulting information would serve as a basis for local educational and other programs, but it also would guide development of farm programs designed to make nationally desirable adjustments the most profitable and most desirable opportunity for individual farmers.

A comprehensive adjustment study of this type could include research on most of the following problems, but they are listed separately, both for completeness and because some of them can be carried out as separate undertakings, provided the work is planned to fit into the general framework:

2. Special over-all studies of new developments in technology, the rate of adoption, potential effects on farming efficiency, on farm output, and on the national economy. These studies might well include over-all appraisal of other factors which influence farm output; for example, reclamation, conservation, credit, and price support programs.<sup>15</sup>
3. Studies of how farmers in different areas respond to changes in costs, prices, technology, and other conditions. These studies should be made by farming areas and be based on detailed analyses of changes taking place on farms, and the reason for the changes.

<sup>13</sup> Analysis of potential markets would include appraisal of opportunities for expanding industrial uses of farm products, foreign outlets, and other possibilities.

<sup>14</sup> For a more detailed outline of the steps involved in a nationwide study of this type, see "Interregional Competition as it Affects Agricultural Development," prepared by the writer for the 1957 meeting of the Western Farm Economics Association.

<sup>15</sup> If output had continued to increase at the average rate of the years 1910-1931, total farm output in 1956 would have been about 18 percent below the level actually attained. This indicates the need for appraisal of the changes taking place, measurement of the relative importance of different factors, and effects on different groups of farmers, as well as on other economic groups.

4. Discovery of the major obstacles to adoption of desirable adjustments in different farming areas and of ways by which they can be overcome. Special emphasis will be needed on problems of farm people who are likely to encounter substantial hardship as a result of natural hazards, or from major technical and economic changes.
5. Economy of scale in farming. Very little information is available by farming areas to answer the following questions:
  - (a) Under alternative projections with respect to prices, costs, and technology, how large would a family farm have to be to pay its way and provide a living comparable with other occupational groups for the same effort, skill, and managerial ability?
  - (b) Is it nationally desirable to provide a wide array of employment opportunities in farming? Historically, agriculture has provided employment opportunities for almost a complete array of skills and managerial abilities—hired labor, small and large family farms (either rented or owned), and large-scale farming units. But do the recent technical and economic changes in agriculture push inevitably toward large-scale operations? Successful use of some new techniques requires both skill and managerial ability of a high order. Will those with more limited abilities be forced either into the hired-labor class in agriculture or into nonfarm employment? Or can some research be undertaken that will provide better incomes for those operating small farms, but who still find their best income opportunity in agriculture?
  - (c) What can be done to improve the technical and management skills of farm people for more efficient operation of family farms? Can aptitude testing be made sufficiently reliable to give young people better guidance in choice of occupations?
  - (d) If efficient family farms can still compete with large-scale units, what size will be needed in different areas to attain a standard of operating efficiency that can compete for resources with large-scale farms?
  - (e) Is it possible for operators of family farms to develop custom work and cooperative services in production (including management services), and cooperative buying and selling that will offset the advantages of integration inherent in large-scale operations or as a substitute for integration from the supplier or processor down to the farm?
6. Analysis of the potential effects of increasing size and decreasing number of farms. Do we need comparative analyses by farming areas of the advantages and disadvantages of family farms with occasional hired help as the predominant organization of farming versus large-scale farms primarily dependent on hired labor? What differences could be expected in the number of farms, farmworkers, efficiency of production, level and distribution of incomes of farm people?
7. Appraisal of changes that may be needed in farm finance, tenure, taxation, and other institutional arrangements to facilitate adjustments and to improve the competitive position of family farms. How can operators of the smaller family farms with little equity capital and limited credit carry out the needed changes in farming? Why have farm real estate values been increasing despite lagging farm incomes? How important are purchases by non-farmers? Purchases to increase the size of farm? Who

benefits from high land values? Under present high investment requirements, how can young people with aptitude for farming get started on efficient family farms?

8. Risk and uncertainty in farming. How do risk and uncertainty affect farmers' ability to undertake desirable adjustments? What are the effects on efficiency. On size of operations? Can we develop improved measures of protection against natural hazards in farming? The economic hazards? How would such measures affect production and farm incomes? We have merely scratched the surface in application of insurance principles to agriculture.
9. The interrelationships between the economic and the noneconomic goals of farm people. Have production economists overemphasized maximum profits and disregarded other goals? Do some farm people emphasize profits at the expense of needed leisure and more adequate health and educational opportunities for children? Would development of higher standards of leisure, health, education, and community services tend to retard both rapid increases in output and capitalization of income improvement into higher land values?
10. Provision of research background for development of adjustment and resource conservation programs. The studies previously mentioned will furnish most of the necessary factual and analytical background, but the different segments of information will need to be fitted together to develop alternative approaches to a rational, forward-looking adjustment and resource conservation program with the following objectives:
  - (a) Facilitate desirable shifts and avoid outmoded production.
  - (b) Provide opportunities for income improvement.
  - (c) Harmonize adjustment and conservation objectives.
  - (d) Maintain reserve capacity through some means of sharing the premium cost of insuring adequate supplies of food and fiber.

Why do we still have these wide gaps in our information? Why are so many economic problems faced by farmers and policymakers still unsolved? We do have some fragmentary and sporadic studies on nearly all of the 10 problems listed above. Although such studies have furnished useful guides to action in local areas, a number of unrelated and fragmentary studies covering different time periods do not provide the needed answers, at least not to problems of national scope.

The principal reason why these questions are still unanswered is that research resources have not been allocated to provide adequate answers. There is every reason to assume that research devoted to these problems over a period of years would be just as productive of results as research in the natural sciences. But legislators who appropriate funds, research administrators who allocate the funds that are made available, and farmers and others who use the results need to be convinced of the need and the opportunity for productive research in these fields. The greatest challenge facing production economists today is that of demonstrating the potential productiveness of research in these fields.

DISCUSSION: THE ROLE OF PRODUCTION ECONOMICS  
IN THE PROBLEM OF AGRICULTURAL ADJUSTMENT

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I agree with Dr. Sherman Johnson's first statement that he uses the term "production economics" in the broad sense. He also uses the term "research" in the broad sense. It seems that he borders on saying that production economists, given the resources, have the role of providing the answers to all of the problems associated with agricultural adjustment.

In discussing a paper by such a distinguished economist who has contributed so much to his field, it is difficult to avoid the trap of lamenting the lack of time that prevents the speaker from exploring in more detail many of the ideas presented. For purposes of this discussion, I am attempting to confine my remarks to the ideas presented in this one paper here today. I will spend little time on the many points with which I agree in his excellent paper.

Johnson bows in passing to the need for close cooperation between economics and the other disciplines. He emphasizes the need for teamwork. But he does not outline the role of the production economist in these cooperative efforts, except certainly he visualizes this role as a central, if not the dominant, one.

He says there are chronic surplus conditions, both in total output and especially in some of the major commodities and asks why. His summary of the reasons for this situation is excellent. His presentation of the theories of agricultural adjustment spell out very nicely in a few words the major differences in economic philosophy that provide the basis for most of the disagreement among policy makers as to solutions for the "farm problem." I wonder what effect additional information will have on some of the advocates of one or the other theory. At least some persons have made up their minds and don't want to be bothered with facts. Certainly, this speculation is far afield from production economics, but I suspect influences the role the production economist can play in agricultural adjustment.

I agree that most production economists subscribe to some form of a public-interest theory of agricultural adjustment; but a rather influential and highly vocal group apparently subscribe to the let-alone theory. And it is even possible that the political scientist is the appropriate individual to appraise this phenomenon. But we can accept either one and find that the production economist still has a central role. My comment here is that Johnson appears to have been unduly modest in



giving the production economist credit for already having provided much information useful in choosing direction.

Is not the fact that much of this information has not been made available to enough people (or at least the information has not been used) as much a problem as the lack of information? My personal opinion that the production economist has not played the role he could or should is at least partially because he has been unwilling to do so, rather than because he had no helpful information. Neither farmers, Congress, farm organizations, or businessmen can avoid decisions simply because they do not have all the information they would like to have to make the "right" decisions. It seems to me that the production economist has the role of providing information and methods to appraise alternatives and to present conclusions even though he may not have sufficient information to answer all the questions.

The formidable array of questions asked appears all-inclusive. I assume the speaker does not mean to imply that the production economist can answer them all. But from my experience, especially recently as an economist working principally with scientists trained in other disciplines, we often give the impression that only the economist can answer the real, important questions. We tend to relegate the agronomist, or the engineer, or even our fellow social scientists to the role of "chore boy." We give the impression that the roles of the other disciplines are to design their experiments and to gather their information so that we as economists can analyze their data and come up with the answers. I find that many of our colleagues in other fields of study do not visualize the role of the economist as quite so important. I realize that Johnson is fully aware of this problem and has made great contributions in attempting to counteract this attitude. Still, I feel his paper tends to provide some basis for such attitudes on the part of those not trained as economists. Perhaps the way to insure economics its proper role is to overstate what we can do and hope to end up with the areas in which we can make a contribution.

I agree wholeheartedly that the greatest challenge to all economists today is that of demonstrating the productiveness of economic research. But I think we must continue to demonstrate our ability to handle problems with resources available before we can expect to secure sufficient resources in economics to tackle the myriad of problems that make up the complex of agricultural adjustment.

And I still wonder what role Dr. Johnson visualizes for the production economist in the problem of agricultural adjustment.

## PROGRESS IN ADJUSTING AGRICULTURE TO ECONOMIC CHANGE\*

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THE topic "Progress in Agricultural Adjustment," implies some goal or norm to evaluate either the extent or method of adaptation for agriculture. An aggregate imbalance exists within agriculture and between it and other industries if the criterion used is comparable per capita income or marginal value productivity of resources. Attainment of adjustment is denoted by marginal resource returns approaching equality among firms and between firms of agriculture and other relevant economic sectors. Three types of solutions are suggested to bring about comparability of resource returns and, therefore, of incomes. Two, proposed mainly by persons engaged in agriculture, imply *bringing the adjustment to agriculture* by adjusting the economic structure to agriculture. The third, proposed mainly by economists, involves *adjusting agriculture to the economic structure*. The first two include (a) applying monopoly production policy to crucial crops and (b) altering the demand function to increase returns on the basic mix of resources now used in agriculture. These two popular "man on the street" solutions to the farm problem have served as the foundation (a) for governmental programs over the past 20 years and (b) for large quantities of funds earmarked for particular marketing research.

### *Production control policy*

The quickest, but not the economically most desirable, procedure for *bringing adjustment to agriculture* would be effective monopoly production policy. However, American farmers are unwilling to accept the degree of regimentation and input rationing required to effectively control production. Two decades of experience with allotment and soil bank programs provides evidence that, while altering slightly the production possibility curve of agriculture, "control" centering on use of the single resource, land, does not control output. The industry has a current sub-optimum resource allocation pattern that can be altered slightly to maintain the upward trend in output. Existing institutional structures cause conventional "control" programs to catalyze a resource reallocation that increases output. Control might be affected by curtailing output or sales of a sufficient number of products, in contrast to attempts to establish quotas on land. However, because of conflicts in economic and political

\* Journal paper J-3277 of the Iowa Agricultural Experiment Station, Project 1135.

interests among regional and commodity groups, effective monopoly production policy, raising resource returns in agriculture to levels comparable with relevant other industries, is not likely. Even if it were, the method would be rejected by most economists as a long-run solution; largely because it conflicts with welfare maximization by the national community.

### *Increasing demand*

Popular proposals for increasing demand, and still for *adjusting the structure of the economy to the resource mix of agriculture* include: improving the product quality, advertising and other promotional schemes, incorporating special processing services with farm commodities, and improving consumer diets. Farm-generated interest in improved marketing efficiency also relates to demand and price improvement. Lower cost functions for marketing firms and industry competition should force (a) an increase in prices of farm products that serve as inputs and/or (b) a decrease in the price of food commodities at retail; causing farmers to gain through increased volume and/or price. Interest in improved diets often relates to increasing food demand.

We can evaluate (a) demand expansion activities and (b) production control in terms of past accomplishments or future prospects. Progress of both in adjusting the economic structure to agriculture has been small; prospects for the future appear equally small. Demand expansion activities, aside from the variables of population and per capita income, particularly have little near-term promise for *bringing the adjustment to agriculture*. Small gains may be possible from concerted efforts along these several lines. But, in general, they will not bring short-run comparability of returns to the current resource mix of agriculture. Time series data and somewhat more subjective estimates of recent studies indicate that the elasticity of agricultural output in respect to time currently does and can continue to exceed the elasticity of population in respect to time. Hence, with an elasticity of about unity, for food consumption relative to population, food output is predicted to be large relative to food demand for the next decade or more. Advertising, quality improvement and related "demand shifting" mechanisms may improve somewhat the outlook for particular commodities, but they provide dim prospects for the agricultural industry. Material gains for one product come mainly at the expense of another product. Because of substitution effects, a successful "eat-more-beef" campaign is equivalent to an "eat-less-pork" campaign, or an "eat-less-poultry" campaign. As Cochrane has indicated, quality or product change through incorporation of special services such as packaging and freezing results mainly in demand expansion for services of firms providing packaging and freezing;

and not for the product of farms.<sup>1</sup> Consumers substitute frozen peas and canned hams for canned peas and ordinary ham. While they increase tremendously the consumption of deep freezes and food containers, they may consume very few if any additional peas or hams.

Neither does it appear that currently projected growth in national and per capita income will *bring the adjustment to agriculture*: (a) The aggregate income elasticity of demand for farm products is too low relative to the elasticities for services incorporated with food and to other goods and services. (b) The elasticity of agricultural output in respect to time is too high. Continued economic growth, the existing surplus capacity of resources in agriculture and trends in technological improvement, call for adjustment of agriculture to the economic structure.

Thus, we are left with the third or orthodox proposal for solving the long-run income and resource problems in agriculture. The equilibrating adjustment is from the side of supply and the resource structure of the producing sector, rather than from the side of demand and the consumption pattern of the household sector. It is one of adapting the aggregate output, the output mix and the resource combinations of agriculture to the current and prospective demands of consumers. The economic criterion for evaluating adjustment progress thus becomes the conventional condition of value productivities for agricultural resources which are comparable to factor returns in other sectors of the economy. Given the empirical facts and using this criterion for evaluating the extent of progress in agricultural adjustment, the situation has called for a flow of labor out of agriculture, an increase in the amount of capital per worker, an expansion in farm size and, in some localities, an upgrading of managerial skills of farmers and adoption of improved technology. We do not expect that the equilibrium conditions of the undergraduate text will ever be attained. We hope that they aren't, because economic progress would terminate. Progress will and should continue, based on further technological improvement, capital accumulation, greater magnitude and skill of the labor force and changes in consumer preferences. Hence, continuous adjustment is required in any sector of the economy. But in the case of agriculture, adjustments need to take place with greater facility and speed. Currently, the goal needs to be less one of complete attainment of orthodox equilibrium conditions and more one of making up the "adjustment backlog" created by relatively large (a) strides in technical advance, (b) farm birth rates and (c) nonfarm economic growth.

<sup>1</sup> Willard W. Cochrane, "Advertising—Fact or Fancy," *Farm Policy Forum*, Volume 8, No. 5, 1956.

### *Long-run Solution*

The orthodox solution to the agricultural problem implicitly has been: reduce the labor force by shrinking output to equilibrate food supply and demand and thus raise resource returns. This pat solution, in about the cause-effect sequence outlined, is retailed quite widely; apparently as the immediate solution of the farm problem. I do not question the long-run directional accuracy of the suggested adjustment. I question, however, whether these adjustments *per se* can alleviate the aggregate problem in the next decade. (Growth in population-based demand may help do so in the next decade but a decline in the agricultural labor force *per se* will not do so.) The orthodox solution, moving surplus population from farms to other industries where the marginal value productivity of labor is greater, is a long-run solution to the farm problem. It does not promise to relieve short-run surpluses. Progress toward any long-run objective of an agricultural labor force consistent with the techniques and relative demands of the economy may well accentuate the near-term surplus of farm products. In numerous segments of American agriculture further downward adjustments in labor force, farm population, and farm numbers promise to increase farm output. A review of trends and adjustments over the past decade illustrates why this may be true.

#### *Progress in adjusting the labor force*

On dramatic change in American agriculture over the past two decades has been the decline in total labor input. U. S. farm employment declined by 37 percent between 1935 and 1956. Transfer of workers from agriculture has been most rapid in the postwar years, amounting to a decline of nearly 25 percent since 1945 in number of persons employed. Comparable changes have taken place in other facets of the industry's resource structure and population. Total capital per worker, measured in constant dollars, increased by 64 percent from 1940 to 1956, or from \$7,382 to \$12,759 per farm worker. In contrast, capital per nonfarm worker increased by only about 35 percent in this same period. Although the situation differs by geographic region, 1956 capital assets per worker were about 150 percent greater in agriculture than in nonfarm industries. The number of farms decreased by 30 percent between 1935 and 1954 and by 22 percent between 1940 and 1954. Accompanying these changes in the farm labor force and the resource structure of agriculture, farm population declined by 43 percent from 1940 to 1956.

The rate at which the agricultural labor force has adjusted relative to changes in productivity from improved technology also can be used as an adjustment criterion. With 1940 as the base year, labor productivity



in agriculture increased by 90 percent in the 15 years to 1955.<sup>2</sup> Considering some change in composition of output, only about 55 percent of the 1940 labor force was required to produce the 1955 output. However, during this period, the agricultural labor force declined by only 25 percent. Labor freed by technical improvements, but which remained in agriculture was about 20 percent of the 1940 agricultural labor force. Slightly more than two million farm workers had been freed from agriculture by technical improvement, but had not left the industry by 1955. However, an additional 20 percent decline in the labor force would not have brought about a similar decrease in output: output increased by 36 percent while farm employment declined by 2.7 million during the period. However, transfer of an additional 20 percent would have helped relieve the income pressure by allowing adjustment in size of remaining farms. Income improvements of persons remaining in agriculture and operating farms of current average sizes must look mainly to this adjustment, and the scale economies associated with it, in a long-run balanced agriculture.

The 20 percent figure is a simple measure of the gap between rates of increase in labor productivity and decline in the farm labor force during the period. It is smaller than required to bring about balance because a surplus labor force already existed in 1940. (Of course, a portion of the agricultural labor force is represented by firmly established older persons, persons remaining because of health reasons, some family workers, and others who are not mobility potential.) The farm labor force for the nation as a whole could be decreased by 50 percent of the 1950 level, or from 9.3 to 4.6 million farm workers or by 40 percent of the 1955 level. This absolute change would be about equal to that of the 20 year period 1935-54 when around 4 million workers left agriculture.<sup>3</sup> In this sense, adjustment of the labor force has progressed only about half as far as it should. It needs to be perhaps twice as rapid as over the past decade; with the absolute reduction in the labor force being as great in the next 10 years as it has been in the last 20 years. It won't attain this rapidity without stepped-up aid in education, employment opportunities, and information and related services for aiding mobility.

Adjustments of this magnitude are required if, aside from part-time,

<sup>2</sup> Based on USDA statistics. For more details see Earl O. Heady, *Adjustments to Realize Gains from Technical Progress*. (In Iowa Agr. Exp. Sta. Special Report No. 20. Part I: Adjusting Agriculture to Economic Change.)

<sup>3</sup> This conservative estimate is based on comparisons of labor productivity between economic classes of farms in different economic areas of the United States. For somewhat comparable estimates, see J. D. Black, "Agriculture in the Nation's Economy," *Journal of Farm Economics*, Vol. 38.

semi-retired, and similar farming operations, returns to labor and capital in agriculture are to be drawn to levels comparable with resource prices, represented by interest and wage rates, now prevailing elsewhere in the economy. Current farming techniques would allow production of food requirements of the nation with a labor force of this magnitude. Current techniques also would allow a reduction by a third or more in the number of farms over the major crop producing sectors of the agricultural economy. Farms of *modal* size, but not farms which already are large, in corn and wheat areas might readily expand acreage by 50 percent, on the basis of the existing surplus capacity of labor and machinery. Expansion in farm size would need to be even greater in much of the Southeast, if more units were of a magnitude to realize the scale economies of existing farm machines, and to provide resource returns equal to other employment opportunities. Conservatively, we need only 2.5 million commercial farms, a decline of nearly a million from 1955, to allow (a) reasonable attainment of existing scale economies and (b) a favorable return to farm labor. Or in terms of all farms, a conservative adjustment goal would be 3.5 million, with 2.5 million commercial farms and a million part-time and similar farms. This would represent a decline of 1.3 million from the 1954 level. The decline in farm numbers over the 20 year period 1935-54 was two million. Hence, again, adjustment has progressed only somewhat more than half that needed if resource returns are to compare favorably with other sectors of the economy.<sup>4</sup> The number of farms declined by .6 million between 1950 and 1954. The absolute rate needs to be maintained upwards of this rate over the next 10 years, if balance in the sense of orthodox economic equilibria is approached by that time.

### *Contracting output*

Given the prospect that output will press on demand for the next decade, or even two, production of some agricultural products needs to be adjusted downward. We have made little progress in this direction even for crops with production controls. Largely as a result of weather and control programs, acreages of corn, wheat, and cotton have declined by 4.5 million, 16 million and 8.7 million acres since 1953. But some reduction in planted acreage would still be required to bring production (based on average yields) and consumption into balance, especially since some of the reduced acreage of corn has been offset by an increase in barley and grain sorghums. Current farm programs have done little to

<sup>4</sup> The criterion used is that stated. The number of farms could be considerably less if the criterion were simply that of producing the nation's food requirements with a minimum number of farms consistent with modern farming techniques.

bring about adjustments in land use, by soil regions, according to needs dictated by consumer demand and local climatic conditions. In fact, they have generally retarded progress in an optimum spatial adjustment of production.<sup>5</sup>

A shift of land from surplus commodities would not result in a general and quick withdrawal of this resource from production. Aside from that acreage favored spatially to meet expanding urban and industrial demands, agricultural land has a reservation price approaching zero. The main opportunity is to shift to less intensive products for a large acreage now devoted to row crops and grains. The opportunities in extensification are largely forages for livestock production and forestry and should take place in fringe locations defined by soil and climate. Supposing that improvements in techniques can keep relative pace with those in recent years and using accepted projections of population growth over the next 20 years (and considering some change in the composition of food consumption over the period) we have around 35 million acres of crop land which should be shifted to these more extensive uses, or to non-farm uses, over the next decade.<sup>6</sup> While the shift should be from grain and row crops to commodities such as beef and lumber, products representing a more intensive agriculture and having higher income elasticities of demand, it must be looked upon as an adjustment requiring upwards of 10 years for noticeable effects. Technical considerations and the financial position of farmers stand in the way of speedy conversion, even if the means were in sight.

To the extent that aggregate output can be drawn more nearly in line with demand through direct withdrawal of land from agriculture, the

<sup>5</sup>The geographic and historic restraints of control programs cause the effective acreage reduction still required to appear less than is actually needed (as compared to a reduction based on the relative preferences of consumers and the productivity of resources at particular locations). The writer and others are engaged in research to determine the aggregate magnitude of adjustment required to meet annual demands for food and feed grains. The research will consider comparative advantage and will indicate the particular areas requiring acreage shifts as indicated by this framework of analysis: We attempt to minimize the function  $f(X) = CX$  where  $C$  is a vector of costs, with  $c_{ij}$  ( $i, j = 1, 2 \dots 190$ ) representing the cost of producing a unit of crop in the  $i$ -th producing region and in transporting it to the  $j$ -th consuming region. We minimize this function subject to the restraints  $BX \leq R$  where  $X$  is a matrix of crop activities with element  $x_i$  representing output of a particular grain crop in a particular region;  $R$  is a matrix of restraints on production with  $r_i$  representing the land supply of a particular region or the utilization requirements of a particular consuming sector;  $B$  is a coefficient matrix with element  $b_{ij}$  representing the rate at which the  $i$ -th restriction is transformed into the  $j$ -th crop activity.

<sup>6</sup>For comparable estimates, see James T. Bonnen, "A Long-run Model." (Proceedings of a Conference on Adjusting Commercial Agriculture to Economic Growth. Sponsored by the North Central Farm Management Research Committee. In process of publication by Iowa State College Press.)

adjustment will come largely in areas of industrial and population concentration. As an indication of longer-run trends, the amount of land in farms for the four states of Mass., Conn., R.I., and N.Y. declined by 25 percent between 1920 and 1950. These shifts in land use will come mainly in the agricultural-industrial transition areas. This front, with land devoted more particularly to residences, trees, etc., will move westward, but the acreage involved is too small to have any noticeable effect on output, considering aggregate trends in techniques.

A final criterion for evaluating agricultural adjustment could be comparative resource returns. Although agriculture has made relatively large adjustments in labor force and capital per worker, the data do not show comparable improvement in returns to agricultural labor. Relative to nonfarm workers, returns to labor in agriculture have declined, in aggregate, over the past 5 years (and also over the past 10 years). The withdrawal of labor from agriculture has not been sufficiently great to increase relatively the marginal value productivity of the remaining labor force. This is true even though the physical productivity of labor in agriculture has continued to increase. The reason for this divergence in physical and value productivity is quite obvious. The increase in total output, and output per worker in agriculture, has taken place against the backdrop of low prices and income elasticities for farm products; a condition leading to depressed value productivity of farm labor. In contrast, however, the rapid increase in national income and relatively high elasticities for nonfarm goods and services (and also better "bargaining organizations") has led to a rapid increase in value returns to nonfarm labor. This difference, of course, is one that will call for a continued adjustment of agriculture. Growth in national and per capita incomes and differential demand elasticities will continue to cause depressed returns to agricultural labor, even in periods when growth in total output of agriculture only parallels growth in population. In this sense, exact attainment of adjustment in agriculture is not likely to be experienced at any time in the next 20 years. Some important degree of adjustment will likely be required over the entire 20-year period.

#### *Continued output growth*

We have cited adjustments in agriculture and have related these to further adjustments possible (a) in terms of current techniques, (b) in lifting labor value productivity to levels paralleling other industries and (c) in approaching some sort of long-run equilibrium for agriculture. But we don't look upon these trends and prospects as the short-run solution for the agricultural problem. The changes cited represent fairly remark-



able adjustments already, in labor inputs and factor combinations for American agriculture. Still the rate and absolute magnitude of adjustment has not been great enough to lessen production or eliminate the farm problem. While the farm labor force declined by nearly 40 percent after 1935, total farm output increased by a slightly larger percentage. As explained before, this short-run possibility exists because of the great surplus capacity, or underemployment, of specific capital and labor resources in agriculture. Simple empirical inferences, based on trends of the past two decades, lead to the conclusion that further reductions in the labor force and number of farms will take place while output of farm products is increasing.

Our hypothesis is that the net effect of further reduction in total labor input, and consequent increase in farm size, will be to augment agricultural output for several years before labor reductions cause output to diminish. Families leave farming mainly because of natural causes (death, age, health) and economic forces (comparative monetary or real income). Farm consolidations, arising as families leave agriculture because of economic forces, present opportunities for increasing output since relative income disadvantage is greatest for operators who possess small amounts of capital and managerial skills.<sup>7</sup> As they leave agriculture, the farm is consolidated by a neighbor who generally has a brighter farming outlook. Possessing greater managerial ability and capital, he can operate the added acreage with the same efficiency as his previous unit. He uses fertilizer, improved varieties and other practices that increase yields. Total capital input represented by these practices on the combined farms is increased, although the total capital input, including machinery investment, may well decline.

Illustrating these possibilities, results of a study by the writer and Randall Hoffman are shown in Table 1. The sample is on Marshall silt loam in Iowa; and area about average for the Cornbelt. Farms consolidated typically are operated by remaining farmers, with only a slight increase in labor and capital of their own; the total employed on the combined units being less than for the separate units. Remaining operators apply more yield-increasing techniques and have higher yields than those who leave agriculture. Most remaining farmers add no machinery, or only special machines. They do not duplicate the machine units of those who relinquish the land.

These same possibilities exist over wide areas used for the grain crops

<sup>7</sup> This fact, although self evident, has been illustrated many times via farm record and survey summaries. The writer and others have completed three recent studies, indicating the income differential between farm income and nonfarm wage rates for farmers with various amounts of capital and managerial levels.

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currently in surplus. Given the current surplus capacity of labor and machine capital, the farm labor force might be decreased by a third in much of the corn and wheat areas, without causing a reduction in output of field crops. And the accomplishment can be made with less, or certainly no more, total capital than is now used in these areas. Capital now in the form of surplus machines can be transferred into fertilizer and other capital forms representing improved technology, with further expansion in output.

Adjustments of the magnitude and nature outlined above are in the direction needed in our growing economy, if the orthodox criterion of

TABLE 1. EFFECTS OF CONSOLIDATION ON RESOURCES EMPLOYED AND FARMING PRACTICES FOR SAMPLE OF IOWA FARMS

Item	Farmers leaving	Farmers consolidating	Total for two units after consolidation
Acreage in farm	167	244	382
Total value of machinery	\$2,900	\$6,540	\$7,440
Average corn yield	88 bu.	44 bu.	
Percent farmers using fertilizer	13.3	48.4	
Fertilizer expenditure per acre	\$0.46	\$1.92	
Percent farmers spraying for borers	1.7	4.3	
Percent farmers spraying for weeds	31.1	45.4	

comparable resource returns is used for judging progress in adjustment. They result in a transfer of labor from agricultural products in relative surplus to other goods and services to which consumers attach relative premiums. But they do little to solve the short-run farm surplus problem. Eventually, we would expect that the types of extensification mentioned above, along with population-based trends in demand, can restore balance between output and consumption. However, even a *short-run* of ten years is a *long-run* for a family with livelihood from farming.

#### Groups Who Gain

We must recognize, however, that progress toward any long-run goal of a reduced labor force and farms operated on a scale to give comparable resource returns can represent direct short-run gains and losses to particular groups in agriculture. Included in one group are persons who move from farm to nonfarm employment. If they possess insufficient capital and operate inefficient units, transfer to employments of higher real income will increase their welfare. Second, is the consolidating group that remains in agriculture. If they intensify techniques and expand farm size to reduce unit costs sufficiently, relative to decline in product prices, they also gain from a reduction in the labor force. Third is the

group that remains in agriculture and is unable to expand farm size. Their relative welfare will be depressed further if product prices continue to decline relatively because of continued growth in output (from new innovations and further technological improvements resulting from consolidation). This group includes mainly families unable to adjust because of age, health, skills, capital limitations, lack of knowledge and similar considerations. The typical middle-aged farmer perhaps falls in this group. Hence, while the orthodox solution of adjusting agriculture to the economy can increase the welfare of some now in agriculture, it will cause others to be faced with continuous income depression.

The greatest current need is for expansion in size of small farms that generate insufficient income and result in great underemployment of labor. From the standpoint of both income distribution and labor productivity, it would be preferable to have undersized units consolidated, rather than for a large farm to annex a small one. However, two major difficulties stand in the way of any optimum consolidation pattern based on these criteria. One is the spatial characteristic of the farm firm. Generally, it needs or prefers a contiguous acreage, or one relatively so, for consolidation. Most frequently, a small farm is consolidated with a contiguous large one, rather than with another small unit at some distance. The other difficulty is that of capital. Operators of larger units more often have the capital for adding acreage. Families with few assets and a small acreage seldom can bid for consolidation, even though their labor is highly underemployed. (In industrial areas, they more often turn to part-time farming than to farm expansion as a means of augmenting income.) In areas of concentrated small, low income farms (e.g., share croppers) the problem of expansion in farm size is more one of capital availability than of spatial considerations.

#### *Adjustment and Emphasis in Economics*

Agriculture economists are faced with an important challenge and responsibility in helping agriculture adjust to economic change. Aside from providing more solutions for the short-run problem, the greatest need is in education for longer-run adjustments. Budgets need to be shifted in the direction of extension education. The pressing current need is to inform farm people of the outlook in farming relative to other industries so that they will understand the long-run economic situation, to help farm families assess their own capital and managerial resources, so that they will know whether to remain in agriculture or transfer elsewhere, to help create employment services and information, and to direct schooling and training of youth and thus increase labor mobility and guide labor into most productive pursuits. Finally, a great need in extension education is to inform both farm and nonfarm voters of the

limitations and possibilities of past and potential legislation and programs directed toward the farm problem and agricultural adjustment.

Qualitatively, we have sufficient research to indicate the cause and nature of the adjustment problem, and the direction adjustments should take. The basic problem and the adjustments needed to solve it, if we accept the orthodox long-run solution, were recorded in the literature more than 10 years ago. They have been reviewed and refined in subsequent literature. We should, of course, continue research to provide qualitative data in critical areas. However, the adjustment problem will more nearly be solved by some intensive effort in economics education, than by all the effort, devoted to deriving regression coefficients, structural equations, inverse matrices, interdependence coefficients and other amassing and refining of empirical data over the next 10 years. Similarly, some well prepared extension materials, to inform people of the basic problem and the adjustments needed to solve it, will accomplish more in adjustment than will all of the books written for congressmen or administrators to read, or all of the technical articles published in journals, directed at education of economists by each other. We say these things not because we believe that research and scientific inquiry should cease, but to emphasize that the greatest current need to accomplish long-run adjustment is in economics education.

#### DISCUSSION: PROGRESS IN ADJUSTING AGRICULTURE TO ECONOMIC CHANGE

R. J. HILDRETH

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Heady's paper gives us some insight into the thinking going on about "agricultural adjustment" at Iowa State College. This program has received favorable editorial comment in a number of farm publications. "Agricultural adjustment" may be a new vehicle for obtaining funds for agricultural economics research.

As one who considers himself an orthodox economist, I am in agreement with the framework and theoretical analysis of Heady's paper. However, few points and implications bother me and I should like to discuss them. I shall not discuss the many points with which I agree.

As an orthodox economist, Heady has assumed the goals of society and the firm to be efficient allocation of resources and profit maximization. In my opinion these goals do represent the dominant motivating force in society and an analysis based on them leads to a good approximation of long-run trends and adjustment. However, our frustrations as economists may be reduced if we recognize that society and individuals also have other goals that may conflict with those assumed. These goals may

include such an idea as every farm boy has the right to become established in farming. Where a conflict of goals exist, it is assumed that a course of action will be taken to maximize the utility of the decision-making unit. For the problem under consideration, my opinion is that the long-run course of action will be rather close to that postulated as needed in Heady's paper. However, an analysis of the problem also assuming other goals is desirable.

Heady's point concerning the use of schemes to increase aggregate demand is well taken. However, advertising and quality improvement may aid in the shift of expenditures from nonagricultural products to agricultural products in certain areas, e.g., fruits, and development of industrial uses for agricultural products. Also along this line Heady does not recognize the possibility of expanding demand for a number of agricultural products through expanding and stabilizing foreign trade over a period of years. At least part of the recent difficulty in cotton, wheat and rice can be attributed to a decrease of the movement of these products into foreign trade. Thus, possibilities of demand expansion may slightly aid although not solve the problem.

Although I think the shifting of land use from row crops and grain to products with more elastic demand is needed, I have a question about the choice of products. A current report indicates that we are now producing saw timber at a rate in excess of disappearance of this timber.<sup>1</sup> Secondly, there will be some opposition to the production of more beef. Undersecretary of Agriculture Paarlberg, at a recent conference in Texas, suggested that a shift to more livestock is a needed adjustment. He was immediately challenged by a rancher from west Texas who felt that as far as he was concerned we had too many cattle already and the price of cattle was too low. An alternative shift might be toward the use of land for recreational purposes. Society, with more leisure and a high level of income, will increase the demand for the use of land for recreation, hunting and fishing. However, it is often difficult for the landowner to sell the services of land for such purposes due to the lack of an organized market.

Heady makes the point that current farm programs have done little to bring about adjustments in land use according to the needs dictated by consumer demand and local climatic conditions. This appears to me to be an accurate statement from most commodities. However, I think cotton may be an exception. In the Southwest, the small producers in the upland areas have almost been forced out of cotton due to drastic cuts in allotments. The larger producers in the river bottoms and irrigated sections, who can produce more efficiently, now account for most of the cotton produced.

<sup>1</sup> *Timber Resources Review*, U.S. Forest Service, U.S.D.A., 1956.



Although Heady has indicated the nature and trend of the adjustments needed in American agriculture, there is still much work to be done in terms of the adjustment needed in particular areas and locations. For example, unpublished data from a study conducted by the Farm Economics Research Service in northeast Texas indicates that only 20 percent of the rural population obtains more than one half of their income from the farm as compared to nonfarm sources. And of this 20 percent, approximately one half are people unable to obtain more income from nonfarm sources for reasons such as age, abilities, and training. The question now is should a policy be set to reduce the number of farm people in this area again by half. This indicates, as Heady has recognized, that considerable more research will have to be done to get at the answers for individual areas.

As Heady has pointed out, the adjustment in terms of labor moving out of agriculture has been taking place very rapidly. He indicates that this trend needs to continue. The question I raise is this; if we had had a definite policy of moving labor out, could we have accomplished it a great deal faster than it has already occurred? Again using the data for eastern Texas as an example, would a faster adjustment have been desirable? However, in a more commercialized sector of agriculture where current price policy has had a dampening effect on the movement of labor, the answer may have been somewhat different.

Heady points out that as labor moves out of agriculture, we will have a consolidation of units and a reduction of cost due to increased efficiency. The act of moving labor out, however, may not leave the remaining farmers in any better position unless they are able to acquire the land and capital resources to expand their operation. As we all know, the land and capital markets have institutional rigidities in them. An opinion of a number of us in Texas is that the major problem of low agriculture income in eastern Texas is not the excess of farm labor supply but the inability to obtain land by the farmers remaining to consolidate their units to an efficient size. This problem, of course, will vary area by area and region by region.

Heady, outside of a plea for more and better economic education, has only hinted at the direction he thinks a policy directed toward adjusting agriculture should take. The benefit of increased education will not be evident for some time and will only aid and abet trends already taking place. It is a truism that the "long run" is made up of a number of "short runs." A very real challenge for economists is contained in developing effective courses of action for the short run. What can be done in the next 3 to 5 years that will aid in the solution of the problem? This is the question farmers, congressmen and administrators are asking.



## SUCCESSFUL PLANNING WITH FARMERS

Chairman: B. T. Lanham, Jr., Alabama Polytechnic Institute

### PLANNING OF TOTAL RESOURCE USE ON LOW-INCOME AND PART-TIME FARMS\*

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**B**UDGETING and linear programming are the two reasonably complete tools of economic analysis used in total resource allocation or farm enterprise organization. Both techniques are used extensively by farm management research personnel but they are not widely used by farm management personnel at the county level who deal with actual farm situations.

In the Parker Branch Pilot Watershed Research study both tools have been used and linear programming has been the primary technique. Problems of resource use that involved total resource allocation decisions and those that involved long-range planning decisions were evaluated with both linear programming and budgeting procedures. The complete budgeting procedures were not used extensively. The problems of short-run resource use and those concerned with the substitution of one resource for another or with a problem of partial resource use were evaluated with partial budgeting procedures. The ability of farm operators to make effective decisions relative to evaluations of complete resource use has been enhanced by the application of linear programming solutions. The object of this paper is to describe the application of linear programming procedures to actual farm conditions and to describe the advantages of these procedures in complete farm planning programs concerned with actual farm situations.

#### *Purpose and General Methodology of the Study*

The study concerns the development of the relationships among the use of agricultural resources in a watershed, the condition of soil and water resources, and the welfare of farm people. The basic question concerns the extent to which hydrologic conditions will be affected by land use adjustments, given the objective of improved welfare of the farm people.

The experimental watershed includes 45 farm families who control more than 2,400 acres of land with 1,060 acres within the watershed

\* Contribution from the Department of Agricultural Economics, North Carolina Agricultural Experiment Station, Raleigh, North Carolina. Published with the approval of the Director of Research as Paper No. 843 of the Journal Series.

boundaries. Presently 71 per cent of the farm operators engage in part-time farming operations and control 1,040 acres, or an average of 32.5 acres per farm. Thirteen farm operators devote all their labor to farming and control 57 per cent of the land resources with an average holding of more than 106 acres. All farm operators had average net farm earnings of less than \$450 during 1953 and 1954 but nonfarm gross incomes to part-time farm operators averaged just below \$3,200 during 1953 and 1954. Family incomes that include net farm income and gross nonfarm family income averaged more than \$3,100 for this period. By the end of 1956, family incomes averaged more than \$3,900 with approximately half of the increase since the 1953-54 period attributable to increases in net farm income. The increase in net farm income since 1953 and 1954 is approximately a third of the expected change in net farm incomes.

This small, low-income and part-time farming area was selected for study because the physical and economic characteristics are comparable to much of western North Carolina and eastern Tennessee. There was a large proportion of part-time farm operators; farm incomes were low; the topography and climatic characteristics are comparable to those in much of the southern Appalachian area. The watershed area is relatively easy to define and to calibrate.

A study of relationships between total resource use and hydrologic conditions quite logically divided into three phases. The first phase of two years duration was concerned with developing benchmarks and plans for farming systems that would achieve maximum efficiency in resource use and economic wellbeing of the people. The second or action phase was initiated in July, 1955 and is scheduled for completion in December, 1957. During this phase all adjustments in land use and a majority of the other adjustments in resource use were expected to be completed. The study, which continues to 1962, should see the completion of adjustments by the end of 1958 and the remaining years will serve as an evaluation period for both hydrologic and economic aspects of the study.

#### *Agricultural Alternatives and Individual Goals*

Development of long-range plans has involved description of the effects of changes in resource use on farm income. The resource combinations have included intrafarm, interfarm and nonfarm considerations.

Complications occur when a research or extensive program is concerned with decisions regarding agricultural resource use involving nonfarm income. These complications are numerous. Two types occurring most frequently in this study were (1) the ranking of goals in resource use and (2) future conditions for nonfarm resources use. These complications

are not unique to farm planning problems with nonfarm considerations but they are not usually recognized.

The first set of complications arises because of opportunities presented to part-time farm families from nonfarm income. What farm planning assumptions are made regarding the rank or ordering of preferences? Does the desire for immediate satisfaction rank above the preference for higher future income through increased resource investment in agriculture? Inefficiently used or abandoned agricultural resources in low-income and part-time farming areas suggest that the investment of limited capital resources in agriculture ranks much lower than other opportunities. If agricultural investments have a low rank, the reason may be found in the high discount rates associated with investments in agriculture. In the study area the high discount rates seemed to have been associated with high risks relative to weather, technological change, market uncertainties and, foremost, the limited knowledge concerning agricultural alternatives.

Another complication relative to ranking of goals involves the desire for leisure versus the use of available labor in agricultural pursuits. Many of the part-time farm operators, seemed to rank leisure above the use of available labor resources in agriculture. One of the most obvious reasons for this decision was their limited knowledge of agricultural possibilities.

The problems of farm planning associated with future nonfarm conditions involve such factors as the stability of the nonfarm market for labor resources and the prospects for increases in real nonfarm income for unskilled and semiskilled employees. Individual understanding and attitudes toward these factors influence the amount and quality of resources devoted to part-time farming operations.

The above complications suggest two broad areas that need careful scrutiny in farm planning studies involving part-time and/or low-income farming areas: (1) a more complete evaluation of opportunities and (2) a clear evaluation of individual goals and preferences.

Three aspects of linear programming fit this need: (1) the necessity for an explicit statement of all resource restrictions, (2) the classification of resources relative to expected productivity levels, and (3) the efficient evaluation of many alternatives. Complete budgeting procedures used in evaluating numerous alternatives can recognize a classified and complete set of explicit resource restrictions. In most farm management programs dealing with actual farm situations, however, complete budgeting procedures are not put to such extensive use.

Explicit statement of labor, capital and limits on enterprise preferences encouraged the farm operator to review his goals, preferences and or-

dering of preferences. The individual operator was encouraged to evaluate the value of leisure or nonmonetary returns to labor relative to farm income possibilities. These considerations usually suggested that two or more levels of labor restrictions might be evaluated and that a classification of the types of available labor would be beneficial.

The request for a statement of capital restrictions (both operating and investment capital levels) encouraged a review of substitution rates through time between farm and nonfarm investments. This differentiation between investments in the farm or home and nonfarm investments also tended to reduce the conflicts arising within the farm family relative to the ordering of investments.

In general an explicit statement of resource restrictions or levels of resource restrictions plus the necessary enterprise budget data makes possible a systematic appraisal of income possibilities from various resource alternatives. The desire to evaluate numerous alternatives has many advantages. To a large extent the part-time farm operator who has not relied on agricultural resources for the majority of his family income (over the last 10 to 15 years) has not kept pace with technological or institutional changes in agriculture. This type of farm operator has also been slow in adjusting his attitude toward subsistence farming. As the nonfarm income offset increased family living costs, there was no real need for evaluating alternative opportunities given the subsistence orientation.

When family goals and attitudes towards subsistence farming are challenged by either the individual or society's interest in their welfare, the desire and need for more complete information that may increase efficiency in resource use are apparent. If a farm family develops a desire to appraise alternatives, or, more specifically, asks, "What are some possibilities?" or "What would you suggest I do?", the agent must rely on experience or on the application of complete farm planning tools. Experience is a partial substitute and a complement to complete farm budgeting or linear programming. When these questions were asked by residents of this watershed and when limited alternatives were under discussion, the usual procedure was to appraise two or three alternatives using complete budgeting procedures. However, when numerous alternatives were discussed, which was the more common position, the difficulties of simultaneously appraising numerous alternatives were reviewed with the individual and use was made of linear programming procedures.

Numerous alternatives in resource use were developed when the following conditions were recognized: (1) that the farm operators had severely limited knowledge of farm enterprise possibilities, (2) when

land resources were classified by grouping soils of comparable productive capacity, (3) when enterprise activities could be developed under alternative tenure systems that included presently owned resources, cash rent or share rent systems, (4) when labor restrictions could be classified to include operators labor, total family labor, hired labor, share crop labor or any combination of these labor classifications, (5) when two or more levels of operating and/or investment capital restrictions were explicitly recognized and, (6) when there were woodland opportunities that included alternative woodland management programs, substitution of other crops for timber land, or the possibility of leaving timber land in its present use and state of management.

The situation on one watershed farm illustrates a need for evaluating numerous resource possibilities and restrictions. This 106-acre farm with 90 acres of cleared cropland and pasture is operated by a 39-year old man who has worked as a railroad brakeman for the past 12 years. He has operated the farm on a part-time basis with an occasional purchase of local labor. During 1953 and 1954 a tobacco allotment of 1.8 acres accounted for more than 85 per cent of the gross farm income.

Prior to this study this operator had made some preliminary moves to initiate a Grade-A dairy but had reconsidered and was contemplating a small cow-calf herd with some veal calf production. He had also considered two types of poultry in connection with a dairy or beef enterprise and the tobacco allotment.

This operator had enterprise preferences. He could state the level of resource restrictions and state the problems in evaluating these enterprise alternatives and resource restrictions. The major resource problems were the following:

1. What resource use organization with full-time farm labor would provide a level of income comparable with present nonfarm and part-time farm income?

2. Under a full-time farm or part-time farm situation, what is an optimum organization relative to the following: (a) combination and size of enterprises, (b) amount and form of additional labor, (c) clearing, managing or maintenance of present woodland areas, (d) the operation of a Grade-A dairy with purchase or production of concentrates, with production of concentrates on home farm or rented land, or with raising of replacements on home farm or rented pasture?

3. Would the purchase of more mountain pasture land for beef production be more profitable than improving the productivity of present acreage?

The effects of these conditions on net revenue estimates at two product price levels and three levels of investment capital were discussed with



the operator. Much additional partial budgeting was completed with the operator on feeding systems, breed composition of the herd and machinery combinations.

The use of linear programming procedures and partial budgeting procedures made the evaluation of numerous opportunities a reality with limited farm management personnel. The increased knowledge of the effects of alternative resource combinations assisted the operator in appraising and differentiating relevant questions with respect to his situation.

### *Presenting Complete Farm Planning Data*

The most difficult responsibility is that of presenting the complete resource package. If the sets of alternatives are described for the farm operator in such a manner that the primary decisions are not concealed, the process can serve to motivate the decision maker. Where farm operators lack any familiarity with farm planning procedures, or have limited knowledge of alternatives and have a subsistence farming operation as in the case of most low-income or part-time farm operators, the educational and motivation responsibilities are more difficult. The responsibility is not to encourage some change but rather to encourage the evaluation of what changes, how to make the changes, and how much adjustment to make. A primary need for adequately presenting this farm planning package is a distinct understanding of the roles of the planning agent and the farm operator.

The most necessary distinction for the application of complete farm planning techniques suggests that the idea of complete farm planning by the farm operator be replaced with an attitude of farm planning by the farm operator in cooperation with the planning agent. This idea suggests that alternatives be prepared for the farm operator and carefully presented to him.

The development and presentation of alternatives does not relieve the farm operator of any responsibilities but classifies the types of decisions to be considered. With an appraisal of numerous alternatives the decision maker can move directly into his own evaluation technique. The usual evaluation technique observed in this study can be summarized into three steps: (1) Make a preliminary selection and seek additional ideas and assessments by the family, neighbors, other specialists. (2) Initiate resource adjustments that are consistent with the preliminary selection but adaptable to other alternatives. (3) As a result of confirmed success on his initial efforts or his associates' efforts in a similar direction, he may proceed to make adjustments that are complete breaks with preplanning experiences.

This evaluation process is encouraged when the resource alternatives presented to the operator contain knowledge of income possibilities limited by personal restrictions on labor, capital and estimates of management abilities, and knowledge that the suggested organizations provide optimum estimates of income possibilities.

These conditions are not often provided by alternative planning procedures applied to actual farms.

The conditions encouraged a long-run appraisal of resource possibilities but did not reduce the need for presenting the data in terms of technical and physical limitations and in terms of short-run adjustments necessary to achieve these income possibilities. As many studies on the decision making process indicate, most decision makers considering short-run prediction problems prefer to consider technological and physical limitations rather than cost and price expectations.<sup>1</sup> This preference was evident in this study. It may be associated with limited knowledge of alternatives, a sincere appreciation of price instability, a preference for short-run production planning and a desire to understand the input-output and price estimates rather than just net revenue estimates. These conditions suggest that implicit technological assumptions behind enterprise budgets, and particularly between the same product with different technologies, should be made very explicit. This phase involves the description of the scientific facts of agriculture implied in the budget, the nature of the production functions that yield this input-output estimate, the range of these input-output estimates and the reason these estimates are applicable to this situation.

The most effective discussion of technological considerations included the evaluation of two or more forms of a given enterprise. For example, there were numerous technologies related to the production of beef. Comparisons of alternative pasture types, feeding schedules and marketing scheduling were readily debated by these part-time farm cooperators.

Further discussion would lead to comparisons of resource requirements. What were the per unit resource requirements of respective types of beef operations? Such physical limitations are readily compared using partial budgets applied to actual resource limitations. The partial budgets served to visualize enterprise relationships that led into discussions of revenue comparisons as well as other physical comparisons.

The concepts of competitive, complementary or supplementary enterprise relationships were also used in linear programming procedures. The application of these relationships to questions of which or what enterprise

<sup>1</sup> See T. C. Morrison, G. C. Judge and E. H. Tompkins, *Impact of Price Expectations and Uncertainties on Decision Making by Poultry Farms*, Storrs Agricultural Experiment Station Bulletin 320, Storrs, Connecticut.

alternatives as well as questions of how, relative to specific enterprises, was most effective in suggesting the idea of a choice indicator that involved economic as well as technical considerations.

Alternative resource combinations and specific revenue comparisons were presented when it was apparent that no real technical obstacles remained. The linear programming alternatives were presented in tables that included the combination and size of enterprises, land use schedules, capital investment schedules and expected net revenue estimates per enterprise.

Subsequent discussion of specific enterprise changes or total resource use changes usually involved reference to alternative capital requirements, price variability, yield variabilities and factors related to probable changes in net revenue estimates. At this point the sets of alternative resource possibilities were of direct application. At this stage it was also possible to utilize price maps that were developed for some farms to assist in describing the stability of suggested organizations relative to product price variability.

In any presentation of numerous resource alternatives the planning agent cannot have a single procedure. The specific steps in the presentation will vary with characteristics of the farm operator. In this study the most frequent technique was the one described and numerous variations were involved.

#### *Advantages and Misinterpretations*

Linear programming has numerous advantages over other complete farm planning tools for a complete farm planning approach that suggests elements of planning for and by the farm operator rather than strictly by the farm operator. The advantages relative to presenting alternatives are as follows: (a) The biases and preferences of the planning agent are largely eliminated. (b) The sets of resource alternatives can be presented with the knowledge that optimum income possibilities have been developed. (c) The marginal productivity estimates provide the agent with some valuable data on the desirability of evaluating other resource restrictions. (d) When additional enterprise alternatives are to be considered relative to a set of resource restrictions, partial budgets can be readily developed with the knowledge of residual resources.

The advantages relative to developing alternatives are as follows: (a) The agent can receive clerical assistance on the actual computations that cannot be so simply delegated when using a general budgeting procedure. (b) A greater proportion of the agent's time can be devoted to developing and maintaining the necessary farm planning data. (c) The agent can more readily classify resource restrictions (land productivity,

labor and capital levels) and enterprise variations with the knowledge that each classification or sub-classification will not require the development of an additional net revenue estimate. (d) The agent can more readily eliminate those enterprise opportunities that require more of all resources for a given amount of revenue since the process dictates an explicit statement of all resource restrictions. (e) The simultaneous appraisal of all resources eliminates the need for selecting that resource with which to initiate the appraisal of total resource alternatives.

3. In direct planning with the farm operator much more time can be spent on the simplest farm planning tool the use and value of partial budgeting.

These advantages accrue primarily to the use of linear programming techniques when applied to actual farm conditions.

There are misconceptions concerning the application of linear programming procedures even with the condition of farm planning for and by rather than strictly by farm operators. The misinterpretations are no different from those that arise in the use of general budgeting procedures, and actually they are not so likely to occur.

The main misinterpretations are that the planning agent may accept the linear programming tool as a substitute for sound basic data. The agent will accept the tool as a substitute for farm planning procedures adaptable to joint planning by the farmer and agent, and numerous alternatives, some of which could be eliminated by inspection, will be presented to the operator and lead to more confusion rather than to clarification.

#### *Farm Planning a Continuous Process*

Success of an applied farm management program will depend more on the planning of the program through time than on the initial planning efforts. The need for evaluation of possibilities does not stop with the initiation of a course of action. Since resource restrictions, technological conditions, factor and product prices and individual resources will change, the planning process has no end.

This subsequent planning will involve some re-evaluation of complete resource adjustments and evaluation of specific short-run decisions. Both linear programming and complete budgeting are adaptable to short-run and long-run resource use evaluation but partial budgeting is much more adaptable to short-run problems than either of the other tools. Since most resource problems that develop after long-range plans have been initiated are associated with short-run adjustments, the use of partial budgets has much more direct application than it generally receives in farm management programs being conducted on actual farm situations.



Partial budgeting is perhaps the most effective farm management tool for explaining and teaching the economic principles of resource use. These principles are most readily accepted by the farm operator when short-run decisions are being evaluated or when only a limited number of resource restrictions are subject to change.

#### DISCUSSION: PLANNING OF TOTAL RESOURCE USE ON LOW-INCOME AND PART-TIME FARMS

R. G. WHEELER

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Dr. Coutu speaks from experience in a project which, like much of my own work, takes extension-type planning analyses for actual farms as the raw material for research. Analyzing adjustment opportunities on sizeable numbers of actual farms is hardly a typical research activity, yet we both see important possibilities in this version of the operating-unit approach. We also hold almost identical views of the farm planning process and the farm management worker's part in it.

Planning, as Coutu sees it, consists of a series of steps including evaluation, adjustment, re-evaluation, and re-adjustment. In this process, the farm management worker or planning agent acts more as teacher than as adviser. His primary objective is to teach, not to perpetuate a service activity. Moreover, he seeks merely to encourage the evaluation of change, not to encourage change of itself. The plans that result have been worked out *with* the farmer, not *for* him or *by* him.

In this conception of the planning process, the farm management worker's most important contribution may well be in helping the farmer to identify alternatives both quantitatively and completely. Beyond this, Coutu expects the farm management worker to develop information on relative income possibilities under specified resource restrictions. His paper contains some interesting comments on how the results are finally to be presented to the farmer for the latter's personal evaluation. This procedure, Coutu asserts, will in no way relieve the farm operator of his responsibilities in decision making.

When it comes to methodology, Coutu sees a place for linear programming, partial budgeting, and complete budgeting, with the last mentioned clearly relegated to third place. This, apparently, would be as true during teaching contacts with the farmer as for analysis within the office or laboratory. The ranking of the two preferred methods, however, appears to vary according to the stage of the planning activities.

Partial budgeting, Coutu suggests, is perhaps the most effective tool



for teaching the economic principles associated with more efficient resource use. This statement I can enthusiastically second. Parenthetically, however, I should add that I have strong doubts about teaching partial budgeting without making the approach through complete budgeting. These doubts arise in large part because even competent analysts make mistakes in setting up partial budget comparisons, especially when they do so apart from the framework of the complete budget. Some of the errors arise in expanding from calculations made on a per-unit basis; others because the analyst has been careless in defining *what* he is comparing with *what*; still others through faulty handling of various kinds of costs. Most such errors would probably be avoided if the partial budgeter were to follow the general form of the complete budget, keeping in mind that his final result should exactly represent the difference between two complete budgets. Here, note that a partial budget, as I am using the term, includes data on *changes* in receipts, expenses, and net income instead of on the *absolute* levels of these items. By nature, partial budgeting is poorly suited for multilateral comparisons, although it is valuable for both teaching and analytical purposes when only two alternatives are to be compared at a time.

For analyzing problems of total resource allocation with numerous resource alternatives present, Coutu favors linear programming. He specifies, in fact, that the object of his paper is to describe the use and advantages of linear programming procedures in complete farm planning programs concerned with actual farm situations. But his paper leaves a number of unanswered questions about the use of programming techniques in the Parker Branch Pilot Watershed Study, as well as room for some skepticism about the advantages claimed.

The description of a case farm provided fine local color along with evidence of apparently successful counseling, but left us completely ignorant about the details of the linear programming analysis and the basis it provided for the farmer's decisions. Additionally, this farm could have been used to show how to prepare an explicit statement of resource restrictions that would take account of the relative subjective value of leisure vs. farm income, of substitution rates over time between farm and nonfarm investments, of expected productivity levels, and perhaps of other equally elusive concepts.

I have often tried to sense these aspects of an actual farm situation, but I have never been sure of measuring them reliably. Lacking such a basis of measurement, I have generally been content to base my quantitative analysis upon receipt, expense and net income data, being careful to point out to the farmer additional variables for which he would need to account subjectively. In effect, I would say to a farmer that Plan A

offers a specified difference in income prospects as compared with Plan B, and it also offers longer or shorter working hours, greater or lesser uncertainties, and other variations to be considered in making a choice. Coutu, on the other hand, seems to be able to incorporate such variables in his programming analysis, under the general heading of labor and capital restrictions. Perhaps I have misconstrued his somewhat obscure remarks on this point.

I am also somewhat confused about the special advantages of linear programming for analyzing alternatives associated with part-time farming. Surely the part-time farmer usually has excellent grounds for specializing in a relatively small number of enterprises, as a means of stretching his limited entrepreneurial resource. He may consider several enterprises, but hardly in all the various proportions that would give programming an important advantage.

Finally, I sense some inconsistency in arguing that programming yields an optimum answer, while at the same time stressing the usefulness of partial budgeting for working out modifications of the preliminary solution. The additional assumptions introduced with the partial budgeting might surely have yielded a considerably different programming solution. Moreover, the seeming precision of the programming solution may be spurious if the data are not highly accurate.

## APPRAISAL OF FARM AND HOME DEVELOPMENT

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### I

**A**PPRAISAL of Farm and Home Development" is an evaluation of its status today, its acceptance by farm families, and its effect on the extension service, present and future. This program has been an activity of importance in Kentucky for nearly eight years. Our experience is used in this paper as a guide. In addition, a selected sample of directors of extension and of heads of agricultural economics departments were contacted for their appraisal.<sup>1</sup>

Farm and home development is generally traced to "balanced farming" as initiated and carried out successfully in Missouri. Following the pioneer work of Dr. Donald Ibach in complete budgeting of whole farm units, the idea was accepted by J. W. Burch, director of extension, and made to be the core of the extension program for Missouri.

Several other states adopted the balanced-farming approach. Some retained the name and others, notably Kentucky, chose to identify it as farm and home development, in which the home was given important consideration.

Farm and home development first attained national prominence as a consequence of the federal appropriation to extension for 1953-54. Since that year, many pages have been written about it. It has been tried in 75 percent of the counties in the United States with approximately 56,000 families participating in 1956, or an average of about 24 families per county.<sup>2</sup>

Let us review pertinent excerpts of the hearings held by the House Agricultural Appropriations Committees of 1953 and of 1954. At the hearings in 1953,<sup>3</sup> Dr. C. M. Ferguson, Administrator of the Federal Extension Service, said concerning present-day farming: "It requires a great breadth of knowledge, many skills and high management ability in both production and marketing."

<sup>1</sup> The writer wishes to express appreciation to the directors of extension in California, Florida, Indiana, Iowa, Louisiana, Michigan, New York, North Carolina, and Wisconsin, as well as to the heads of the Departments of Agricultural Economics in Indiana, Missouri, Texas, and Virginia. The Federal Extension Office, Division of Agricultural Economics, and the county extension agents in 15 Kentucky counties contributed thinking. Despite the wide range of solicited respondents, the synthesis and statements in the paper must be considered solely as those of the writer and not representative of any of the groups responding.

<sup>2</sup> *Farm and Home Development Highlights*, No. 1—Federal Extension Service, U. S. Department of Agriculture, June 1957.

<sup>3</sup> *Hearings Subcommittee Agricultural Appropriations for 1954*, first Session, HR 5227, 83rd Congress, Friday, May 1, 1953.

At the same hearings, Dr. Ferguson said: "The Extension Service approaches this problem (operation of a modern farm), through the farm family as a unit. We believe the farm family holds a unique place in our society. The farm, the home, and the family are inseparable. Every meal is a meeting of the board of directors. Here decisions are made that affect the economic, cultural and social well-being of every member of that family. These decisions influence the part every member plays in making that farm and home an integral part of the life of the community in which he lives. . . ."

On March 16, 1954, the Honorable Melvin R. Laird, U. S. representative from Wisconsin, had this to say about the appropriation to Wisconsin:<sup>4</sup> "The first allotment . . . of increased federal funds for Wisconsin will be used entirely to develop a program of complete farm and home planning for individual farm families."

The Honorable Mr. Laird continued: "We believe that the needs of agriculture and homemaking can be served most effectively through a coordinated program that makes available the full resources of agricultural extension in one approach to all enterprises on the farm. The program that we envision is based on the whole farm rather than the piecemeal type of approach and is designed through personal service to establish a sound economic base under each farm."

Dr. Ferguson, before the Agricultural Appropriations Committee of the U. S. Senate in consideration of the 1954-55 appropriation for the Extension Service, said: ". . . we are proposing here a new look at extension work geared to helping farm families develop the whole farm approach, rather than a more or less specialized approach, that we have taken in the past. . . ."

It is clear, several years after adopting farm and home development as an approach, that a precise statement concerning its acceptance by the public cannot be made without qualifications. When it has been identified to the public as a method of carrying out extension's responsibility, apparently much effort is necessary to keep interest alive. One respondent pointed out that the public is not interested in the methods used by extension; they are only interested in what extension is trying to do and in accomplishments. When farm and home development is identified as another way to carry out a balanced extension program, apparently the acceptance has been good, primarily in the features which the public approves; for example, more on-the-farm and in-the-home visits, the whole-farm approach, and the inclusion of the family as the center of activities.

Subject matter departments seem to accept farm and home development

<sup>4</sup> *Department of Agriculture Appropriations, 1955. Committee on Appropriations, 83rd Congress, Part IV, page 549, March 15, 1954.*

wholeheartedly, as it has increased the demand for subject matter. It has also involved specialists more completely in the agent-training programs and in the handling of on-the-farm problem situations. The effect has been greatest on departments of agricultural economics because of the similarity in many respects to farm management.

To those specialists who have attempted to hold onto their pet projects, farm and home development has proved a dilemma. They seem to be torn between the continuance of their privately sponsored projects and the increased needs for assistance as a consequence of farm and home development. For those who have used farm and home development as a means of strengthening their work, apparently this dilemma does not exist.

The effect of farm and home development on research and instruction at the colleges seems to be limited. Very few states have oriented research projects specifically on farm and home development problems.

## II

The basic problem faced by extension administrators in adapting farm and home development to the going extension program has been that of meeting the tremendous needs with limited resources. If the product of extension's effort is "learning," then the problem of the administrator is to encourage the allocation of the time of his extension staff so that "learning" is maximized.<sup>5</sup> "Learning" as used here, and as understood by the administrator, must be considered within some welfare concept that takes into consideration the need for service to many *vs.* a few, to the innovators *vs.* the slow adopters, to the young *vs.* the old, and other similar paradoxical situations that extension administrators must face.

Farm and home development has opened the doors for us to try our skills on the problems presented by the complex situations enumerated above.

Farm and home development became an important term in extension as a method without a sufficiently clear definition of the concept on which it rested. Much confusion has resulted because of failure to identify it properly. To some workers it is a program, to others it is a method, and to others an activity.

We can simplify our problem by distinguishing between the concept of farm and home development and the methods used to implement it.

Farm and home development may be considered as a package of services available to farm families, designed to further an optimum linkage of three fundamental ideas, which, when put together, give us the concept. Therefore, conceptually, farm and home development is concerned primarily (a) with planning for the future, (b) with consideration of the

<sup>5</sup> Educators say that what is learned is what is practiced—learners learn what they do. In this sense "learning" is a product of extension effort.



family as a unit, and (c) with optimum use of the total resources controlled by the family.

Any concept to be worthwhile must be rooted in theory and thus provide the basis for research. If we accept the basic concept which includes planning, the family, and the total resources, then, from economics and sociology, we have the basic theory from which stems the subject matter framework, and within which the subject matter of the physical sciences may be applied to solve problems in economic and social situations.

Of tremendous importance is the fact that the above described concept of farm and home development is almost unanimously accepted by administrators, subject matter departments, legislators and farm families. The problem, therefore, has been of implementation.

To implement this concept, extension has stressed teaching families to evaluate their needs and wants; appraise their resources and opportunities; analyze their available alternatives in terms of their own situation and adjust their affairs to a new situation created by themselves. In this way, it is supposed that they can evaluate their needs and wants within the framework of their own expectations, but adjusted by modern scientific evidence.

Following these guidelines the approach, due for the most part to the success of "balanced farming," took whole-farm budgeting as the core of the method to approach farm families. As farm and home development took shape with its forms, standardized input-output data, and normalized prices, certain issues soon developed which became the center of debate whenever farm and home development was discussed. Prevalent among the issues were (a) emphasis on individual approach *vs.* group approach; (b) emphasis on orientation to farm management *vs.* no particular subject matter; (c) emphasis on placing special farm and home development personnel in the counties *vs.* personnel carrying other responsibilities along with farm and home development.

The issue of the group approach *vs.* individual approach seems to be about resolved with the conclusion that both have a place and probably the best approach would be some combination of the two. In the discussions I have participated, the main argument of the group approach was its efficiency in the use of the agent's time. Its main advantage seems to be in its effectiveness of teaching. Small groups have proved to be quite effective in generating ideas and in stimulating action. The main advantage of the individual approach seems to be the personal contact and the direct on-the-farm and in-the-home approach to problems.

The unresolved issue of whether to orient farm and home development in the direction of farm management or to avoid any particular subject matter orientation needs more discussion. First, it is doubtful if the issue

exists at the farm level. However, it does exist at the college level. The essential difference seems to be whether applied economics is the prevailing subject matter or whether applied economics, applied sociology, applied psychology, and even intuition will prevail as acceptable subject matter. In the first instance, problems to be attacked can be circumscribed by the limits of economics. In the second instance, all the problems felt by a farm family, for which the colleges of agriculture have information, are subject to consideration. We should also recognize that in the approach oriented in farm management, home management tends to get a backseat. The reason usually given for this situation is that the economic motive (thus importance of economics), is recognized as the primary one, and in home management, which in this instance refers to the field of home economics applied to the management of a home situation, the economic motive is not recognized as the primary one. With home economics, the objective is a good home with a happy and healthy family. To home economists, the income structure is considered as a "given" and, as such, it is a framework to which one must adjust as contrasted with the idea of adjusting the income structure by economics.

Farm and home development magnifies the realization that neither the preferences of a family are given to the agricultural economist, nor is the income structure given to the home economist. Extension workers have experienced considerable difficulty in reconciling the two points of view.

Most administrators recognize the need for a unified approach to farm family problems. Their efforts would be greatly simplified if subject matter people would broaden their horizon to recognize the place of other fields.

Administrators have faced the question as to whether to assign special personnel to farm and home development or whether to make it a part of the regular job of county and state personnel. It has been done both ways. In the first instance, results are more tangible and the tendency exists to make farm and home development an end unto itself. The question of qualified personnel for the broad task also becomes important. When it is a part of the regular plan of work, maintaining interest seems to be more difficult because of the diversity of competing activities for the time of our county extension agents and the more concentrated attention needed for a relatively few families.

### III

To specify the direct consequences of farm and home development is difficult because of the significant and closely related changes that are taking place in all areas of extension effort. However, there is no doubt

but the impact has been great. Farm and home development is credited by many as being the motivating force for a redirection of the total extension effort. Extension workers have long recognized the continuing need for farm and home visits and attention to the problems held by individuals. Farm and home development emphasizes both.

Where farm and home development has been tried for several years there is an increasing tendency to use it to assist low-income families and young farm families in making adjustments. In the commercial agricultural areas, the trend toward more technical and expanded advisory services for fewer but larger farms is practically a certainty. Farm and home development may be used here.

The respondents to my inquiry reported that as a consequence of farm and home development county extension agents can now look at the bigger problems as faced by farm families, and can evaluate them in terms of the total resources of the family. There appears to be a greater need for economic information, a better understanding of local problems, a clearer recognition that agriculture is evolutionary, and thus the need is for continual adjustments patterned to individual situations, with less emphasis on the "pat" answer and less stress on individual practices. The swing has been to the problem-solving approach in which agents recognize that families should choose among the alternatives available to them, and that facts should be presented to assist them in their choice. This approach contrasts with the notion of the campaign, in which the major assumption is that a practice, or a combination of practices, is good for everyone.

Farm and home development has brought the county agent and the home agent closer together in working on the problems of families, as the approach is family-centered as contrasted to man or woman-centered. Because of the direct and intimate contact with the problems of farm families, farm and home development is credited with developing an alertness of the agents to new problems as they develop.

Farm and home development cannot be given the credit for all of the major changes that are taking place in extension philosophy; however, once the farm and home development concept is accepted and the principles that stem therefrom are applied, very significant changes are bound to result. The fact that emphasis has been on the family, on optimum use of the total resources projected into future situations, has produced the over-all consequence of integrating men's work with women's work. The integration of subject matter to the family problematical situation, places the emphasis on teaching to evaluate alternatives. It has brought the agents out of their offices, onto the farms and into the homes as well as the families to the county extension offices. The second wave of con-

sequence resulting from these changes spreads out into the whole extension program and becomes lost in a reorientation of the extension approach and in the allocation of the time of extension agents.

#### IV

The farm and home approach comes the closest of any plan extension has of advising and working closely with farm families on certain important problems and decisions. When the problem of the farm family is approached from the same point of view as the farmer and his wife and the methods are not belabored with frivolities and rigidities, it is bound to succeed, as this is the basis from which a farm family starts its planning.

The concept of farm and home development as identified in this paper stands today as extension's unrealized opportunity. Recognition of the concept has been slow; in fact at this moment it is not recognized by many. Instead, it is, as yet, recognized as a mechanical process that a farm family must go through in order to find the answers to certain questions.

Farm and home development makes the most sense when prescribed steps are minimized. Theoretically, at least, a recognized problem has certain identifiable dimensions. Once they are known, then presumably there is a best method to assist with the solution to that problem. Farm and home development should be used only when it is the best approach to certain problems.

Obviously certain rigidities have been built into the approach, primarily in the mechanics, that have caused difficulty in getting general acceptance. Some of these rigidities include insistence that the wife be a participant in all activities, that certain prescribed forms be completed irrespective of the problem, insistence on a fixed progression of steps, and that the family identify its goals. There are others. Most likely, such rigidities exclude more people than they help and limit the application.

There is no conflict between extension's effort to further extend program development as in program projection or rural development. In fact, farm and home development can become the nucleus of the hard core of both activities.

Of the basic needs in farm and home development, perhaps clarification and understanding of the concept is the greatest need. Through farm and home development we recognize the farm as an economic and a social unit. Economists tend to study it as an economic unit with social forces held constant; sociologists tend to study it with the economic forces held constant, and home economists seek to maximize the preferences of the home with the means as given. The onus is on the extension worker, when he must permit the social and economic variables to change simultaneously. In general, his knowledge is limited by the knowledge

of his colleagues at the state university and similar sources. If extension is to follow the family-centered approach, then farm and home development can be the focal point for a unification of the contrasting methods of study by the economists, the sociologists and the home economists.

Among the most powerful generalizations suggested by experience in farm and home development is the fact that farm and home planning can begin just as easily on the consumption side of the family balance sheet as on the production side. This means both sides are variable and adjustable. From this generalization, the important conclusion stems that farm and home development is, in fact, concerned with the family balance sheet in the future, e.g. moving balance sheet. Within such a framework economics dynamic is of major importance.

As the concept of farm and home development, which centers about the family, planning, and total resources, is more completely understood, it will also become clearer that we cannot send a boy to do a man's job. We will recognize the need for training and experience to capably advise on the "big" decisions of farm families. We will recognize, even more than we do today, that people are more important than things and processes. Finally it is logical to believe that out of the experience of farm and home development will emerge a philosophy that will be significant and permanent.

#### DISCUSSION: APPRAISAL OF FARM AND HOME DEVELOPMENT

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We are indebted to Dr. Nesius for a comprehensive survey of progress in farm and home development and a penetrating analysis of adjustments needed in speeding up future progress. He reports that since its inception in 1953-1954, 75 percent of the counties in the United States have adopted it and that it has been tried with an average of 24 families per county. This is not an impressive record for an approach that has received major attention in the extension service at the federal, state, and county levels. Nesius identifies strategic problem areas that should receive serious study by those sharing responsibility for initiating and conducting this new approach in extension.

I am in agreement with most of the conclusions made as to progress, the barriers encountered, and adjustments needed. I should like to spend my time in further consideration of some of the major points emphasized relative to basic concepts, methods of implementation, and subject matter.



At one point in his paper Nesius states that "the concept of farm and home development has been unanimously accepted by administrators, subject matter departments, legislators and farm families." At another point he states that "the concept . . . is not recognized by many," and still later he states that "clarification and understanding of the concept is the greatest need." I gather from these statements that his investigations lead him to believe that the concept is accepted on faith because of the prestigious personalities advocating it or for other reasons, but that it is not understood to the extent that it redirects extension approaches to teaching in a meaningful way. Nesius understands the concept to mean planning with families for optimum use of total resources. Within this conceptual framework he spells out the changes in methods and activities that extension workers should logically adopt. Others contend that these concepts are not new in extension work and that the associated methods of implementation are not new. Thus, by a process of rationalization it is concluded that farm and home development involves no change in established approaches. This kind of thinking results in the adaptation of farm and home development to existing concepts and programs. In this process of mental screening, redefinition, and adaptation, the original concepts and approaches are absorbed in the established extension program. Using this system of reasoning, those responsible for crime preventions would solve the problem of juvenile delinquency by changing the definition of crime. The concepts need to be defined and clarified in such a way that they have a meaningful impact on action taken by extension workers at all levels. This is a tremendous task in state extension organizations, typically consisting of some 400 to 600 people with many replacements each year.

Farm and home development as conceived by those who initiated it represents a major redirection of extension effort. The idea was adopted by leaders among farm organizations and the extension service at the national level. The new methods are directed at others—farm families accustomed to a different approach. Their acceptance must be won through understanding. The learn-by-doing method of teaching, as well as the teaching of concepts, is a proven approach in extension in gaining such understanding.

Most of the nationwide redirection of effort in extension has taken place during national emergencies, such as war or depression, when the gravity of common problems forced general agreement on policy and programs. In the absence of such external unifying forces to bring about concerted action, internal unifying forces must be strengthened. This would suggest strong administrative leadership in adjusting local programs to include farm and home development as defined at the national

and state levels. A balance between program content derived from national policies and goals and content rooted in the physical, economic, and social situations of local communities and counties is called for.

With general acceptance and understanding of the concepts, agreement on methods of implementation should be greatly facilitated. In the absence of general understanding of the concepts, much disingenuous effort has been expended on advocating particular methods to the exclusion of others. There have been advocates for either technical assistance *or* farm and home planning, full budgeting *or* partial budgeting, written *or* unwritten plans, etc. Extension workers equipped with an understanding of the conceptual framework and a knowledge of methods applicable thereto might use any one or all of these methods, depending upon the problem situation and the time span involved. If a family already has a sound plan, technical assistance in putting the plan into effect may be all that is needed until changing situations call for an adjustment in plans. If the farm and home development concept is followed, any technology deemed applicable would be interpreted and tailored to fit the particular farm resource base. Furthermore, technology applicable to one phase of the farm or household operations would be weighed against that applicable to other phases to insure the adoption of that technology which adds most to net income and satisfactions. In other situations, such as a family just getting started in farming, the farm and home development approach with a family over time may include technology plus assistance with full farm and home planning plus partial budgeting plus participation in group instruction on planning. Doctors don't prescribe penicillin for all diseases. Extension workers in farm and home development should be equipped with more than one method if they are to counsel with families having a wide range of problems, and the particular method used should be adapted to the problem receiving attention.

As farm and home development work expands, the need for keeping subject matter current, tailored to fit the needs of various resource or other areas of the state and interpreted for use in planning will increase. This is a continuous process needing the attention of the specialist personnel. The adoption of some systematic approach for supplying a continuous flow of relevant subject matter would seem highly desirable.

The approach of working with the family as a unit seems to be firmly established in farm and home development. The traditional separation of extension programs and personnel according to three distinct lines of work (4-H, home demonstration, and agriculture) poses the problem of attaining unified effort in solving the problems of a farm and home unit when decisions about any one part are best made with reference to the unit as a whole.

The formulation of general policy by administration, the development of appropriate technical assistance by subject matter specialists, and supervision by the district agents are all strategic in orienting extension work to the farm and home development approach. Deficiencies in either one of these areas will impede progress. The district agents have the major responsibility for seeing that the approach as followed in the counties meets adopted standards in policy, content, and quality. The district agents are burdened with numerous supervisory and housekeeping functions such as recruiting personnel, maintaining relationships with county government officials, instructing new agents, and other work in connection with established programs. Most of them find it difficult to budget time for additional duties in directing the adoption of a new approach such as farm and home development.

Progress has been made in coordinating the new approach in extension with the work of other agencies engaged in related activities. Inter-agency coordination presents many opportunities for speeding up progress in farm and home development. As the work expands, the gains to be derived from coordination increase. Further study and experimentation with methods of interagency coordination would seem desirable if total progress is to be maximized.

## RESEARCH AND EXTENSION FOR TOMORROW

Chairman: P. L. Putnam, University of Connecticut

### OPTIMUM ALLOCATION OF RESEARCH RESOURCES IN A DYNAMIC AGRICULTURE\*

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THE ALLOCATION of scarce research resources to competing ends in a changing economy can be analyzed within several frameworks. In the present paper I have elected to cast the over-all question within the traditional and familiar supply and demand model.<sup>1</sup> We will view the X axis as representing the quantity of research product supplied and demanded and on the Y axis we measure the cost and values of the research product. Our criteria of equilibrium (i.e., optimum allocation of resources) is where supply equals demand. We shall, of course, find that we cannot quantify the variables postulated. Thus, our final inferences must be based largely on hypotheses and value judgments.<sup>2</sup>

Throughout this paper I use demand and supply in the sense of schedules. The short-run supply schedule is the sum of the marginal cost functions of the various research units. Costs are defined to include opportunity costs. Supply equals demand at any level of supply when resources are allocated to alternative research problems in an optimum manner. Consequently, the scale problem, that is the question of the optimum quantity of resources to allocate to research, is not treated. I emphasize research in production economics-farm management because I am more familiar with this area and because I found it necessary to limit the scope of the paper.

Apparently, it is not possible to obtain objective measures of value to research results.<sup>3</sup> There are two major bases of this difficulty. First, a

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\* This paper has benefited from the critical reading and helpful suggestions of Burl Back, Ken Bachman, Ted Booth, Leonard Miller and Odell Walker.

<sup>1</sup> For an alternative formulation see James S. Plaxico and Fred H. Wiegman, "Allocation of Resources in Farm Management and Production Economics Research," *Journal of Farm Economics*, Vol. XXXIX No. 1, February 1957.

<sup>2</sup> A conceptual analytical framework is useful even though we are presently unable to quantify the model postulated. Specifically such a framework is a necessary prerequisite to measurement of the quantitative relationships involved and even if we are unable to quantify the relationships, such a conceptual framework should lend a degree of rigor to our qualitative judgments.

<sup>3</sup> W. W. McPherson, "Goals and Character of Farm Management Research," *Farm Management Analyses: Character of Its Objectives, Scope and Logic*, Southern Farm Management Research Committee, March 1954. Ray G. Bressler, Jr., "Consultants Report," *Agricultural Marketing Research*, AMS-60 (1956), Washington, D. C.

given piece of research does not always have the same degree of usefulness to individual farmers, to the agricultural industry and to society, and we have no maximizing criteria for we have little knowledge of the relative weights to give to demands of various groups. Second, predicting future research results is obviously difficult. We can measure and predict the money and personnel requirements for a given piece of work but we have no means of measuring uncertainty or opportunity costs.

Research results from agricultural economics are demanded by many different groups. We will examine the nature of the demand for research by each important group and attempt to project future shifts in demand. Following a discussion of the anticipated research needs of each group we will consider the present and potential ability of the profession to provide the types of research and suggest ways that we may adjust our research resources to better meet demands in each area. Finally, I shall consider the manner in which the total research job might be allocated to the different research units.

Although the various groups and individuals who will demand the research product of agricultural economics will not require the same types of information, each will administer resources in similar environments. Rather clear directions of movements emerge. The most relevant of these are (1) increased demands for farm products due to an increasing population and higher per capita incomes resulting from increased productivity, (2) a secular shift to the right of the aggregative supply function, at a faster rate than the shift in demand, due to the development and adoption of technical and organizational innovations, (3) an increase in total capital in agriculture and greater dependence on nonfarm produced inputs, (4) a continuation and likely acceleration of the decline in farm numbers and persons employed on farms.

Future demands in production economics and farm management will arise (1) from questions and problems encountered by individual farmers attempting to maximize monetary and non-monetary goals, (2) from efforts of farmers in the aggregate (the agricultural industry) to allocate resources among areas, firms, and products within the industry in an optimum fashion, (3) from desires of society for information to determine optimum resource allocations among areas, industries, firms, and individuals in the society, (4) from the demand of legislative, educational and action agencies for information to aid them to assist individuals and groups to evaluate alternatives, make choices, and/or achieve goals, and (5) from the desire on the part of research workers to improve the efficiency of their efforts.

We are obviously interested in future demands. Current questions are relevant only to the extent that they relate to future problems. We cannot



anticipate future research needs perfectly. However, the *ex post* misallocation arising from imperfect anticipation is likely to be much smaller than an allocation made on the basis of current problems. The different demands on research resources are not independent or entirely competitive. Rather important supplementary and complementary relationships exist. An optimum allocation of research resources must exploit these noncompetitive relationships.

### *Individual Farmers*

Historically, a major share of the research in farm management and production economics has been directed to an analysis of the economics of the individual farm business or of its component parts. This area of work will be no less important in future years; however, some shifts in emphasis within the area are indicated. Major questions demanding attention are (1) scale relationships and the dynamics of growth of the individual farm, (2) decision making with particular relation to dynamics, risk and uncertainty, (3) alternative adjustments in the capital structure and managerial process to permit flexibility for expansion and for the adoption of innovations, (4) improvement in input-output and price data to assist individuals to formulate expectations and to make choices.

We have little research that aids farmers to gauge the impact of farm enlargement on earnings of the various factors or the risks and uncertainties of farming and ranching. We have even less research to evaluate the consequences of alternative methods of farm expansion. Such questions involve implications of renting vs. buying, the effect of various equity levels, and the question of expanding by increased specialization or by diversification.

The theory of decision making in dynamic situations is unsettled. Our knowledge of optimum strategies of decision making is even more scanty. The various price expectation studies have produced similar but, in my opinion, suspect results.<sup>4</sup> Thus, I am not convinced that this approach offers a fruitful area for future research. On the other hand, preliminary results from the interstate managerial study indicate that this work will provide hypotheses for further testing.<sup>5</sup> Work in this area should receive increased attention in the coming years.

At the theoretical level the thinking of agricultural economists on mana-

<sup>4</sup> The first of the price expectation studies is reported in O. H. Brownlee, "Farmers Price Expectations and the Role of Uncertainty in Farm Planning," *Journal of Farm Economics*, Vol. XXXI, pp. 266-75.

<sup>5</sup> Robert W. Greve, "Use and Interrelation of Marginal Analysis and Other Analytical Processes by Farmers in Decision Making," unpublished M.S. Thesis, Kansas State College, January 1957. Albert N. Halter, "Measuring Utility of Wealth Among Farm Managers," unpublished Ph.D. Thesis, Michigan State College, 1956.

gerial questions has largely followed the work of Knight, Hart, Hicks, Friedman and Savage. The work of Shackle<sup>6</sup> appears to provide an unexploited but promising basis for further development. At the empirical-statistical level the theory of games offers promise. A quite different statistical-empirical approach is factor analysis. This technique presumably allows one to ascertain nonobservable underlying forces from observed data. Such techniques, developed largely by psychologists, have been ignored by agricultural economists although a group at Harvard is employing them in a study of business decisions.<sup>7</sup> Some will argue that these methods are too empirical in the sense of "measurement without theory" although they may be quite valuable in helping us develop managerial theory.

Capital for entry into farming and for expansion appears to be a foremost problem facing farmers in the future. Agricultural economists should examine the adequacy of the present capital market in view of the capital requirements of optimum scale of plant. I believe the present capital market will be inadequate. If this is the case, the impact of alternative modifications of the market on individual farms should be investigated. Possible modifications are (1) increased leasing of land, machinery and equipment, (2) lowered equity requirements with group or social insurance of loans, (3) increased vertical integration similar to that now common with respect to contract financing of broilers, laying hens, turkeys, and, to a lesser extent, hogs. Impacts of each should be evaluated in terms of managerial responsibility, risk, flexibility, the firm product supply and factor demand functions and the earning capacity of resources.

In recent years the quality of input-output data collected has been significantly improved because agricultural economists have placed more dependence on theory as a guide to the types of data needed and have used improved statistical techniques. Farmers, and those working with farmers, will demand input-output data in the future and they will be selective in the types of information desired. The question of the type of input-output data needed deserves further careful attention.

Acceptable input-output data are expensive to acquire and, in the face of rapid technological advance, they are adequate for only a short period. Thus data should be collected so as to allow multipurpose use. Input-output data with out corresponding error terms appear to be of somewhat dubious value. In developing and applying input-output data we should

<sup>6</sup>G. L. S. Shackle, *Expectations in Economics*, Cambridge at the University Press, 1949 and *Uncertainty in Economics*, Cambridge at the University Press, 1955.

<sup>7</sup>John R. Meyer, "Discussion" *American Economic Review*, Vol. XLVII No. 2, May 1957, pp. 335-339.

be concerned with variance between time periods and between economic units (individuals) within time periods.

The trend toward more cooperative work with physical and biological scientists is most encouraging. This teamwork can produce the kinds of data needed by farmers. Yet, in my considered judgment, economists can render a disservice to farmers, to other scientists, and to our profession by imposing traditional textbook economic models on other scientists as a basis for experimental design.<sup>8</sup> This is particularly true when resources are allocated away from the development of technologically superior functions to work aimed at characterizing existing technology.

Our present firm theory was not developed to suggest or to solve problems of the firm.<sup>9</sup> Noninnovative reliance on our present body of static theory tends to cause us to concentrate too much on questions revolving around levels of input and output to the exclusion of other questions that may well be more relevant. I am not suggesting that economists cannot make very material contributions to the design and conduct of experiments designed to produce input-output relationships. Rather, I am suggesting that existing theory does not necessarily lead us to formulate relevant problems or to solve problems most efficiently. Consequently, we should develop theory or models that fit the problem rather than select problems or force a given problem into the confines of existing theory.

Ruggles divides the process of economic research into four steps.<sup>10</sup> These are (1) the exploration of the problem; (2) the theoretical development of hypothesis; (3) the empirical testing of hypothesis; and (4) the evaluation of conclusions. He proceeds to argue that reliance on existing models tends to ignore the problem exploration stage. Thus he argues,

... the universal use of existing concepts and the hypotheses of accepted theory as a basis for the process of observation and measurement might be serious impediment to hypothesis seeking and discovering.<sup>11</sup>

Perhaps Ruggles overstates his case. However, I believe that researchers in agricultural economics may do well to heed his warning.

### *The Agricultural Industry*

By and large, agricultural economists have failed to build or to extend firm analyses so that meaningful industry inferences can be drawn, and

<sup>8</sup> C. B. Baker, "Discussion: Economics and Range Resources," *Journal of Farm Economics*, Vol. XXXVIII No. 5, December 1956, also suggests this possibility.

<sup>9</sup> Robert Dorfman, *Application of Linear Programming to the Theory of the Firm*, University of California Press, 1951.

<sup>10</sup> Richard Ruggles, "Methodological Developments," in Bernard F. Haley (editor) *A Survey of Contemporary Economics*, Vol. II, Richard S. Irwin, Inc., 1952.

<sup>11</sup> *Ibid.*, p. 425.

only limited resources have been devoted to aggregative industry analyses. Yet, many of the problems faced by the agricultural industry and by individual farmers cannot be adequately treated until our knowledge in this area is improved. In future years demands for such analyses will increase and additional resources will need to be made available. Topics requiring particular emphasis will be (1) individual and aggregative industry product supply and factor demand functions, (2) the structure of the industry with emphasis on interregional competition and on the competitive efficiency of alternative organizational forms of the individual firm (corporation, family farms, etc.).

Although agricultural economists evidenced considerable interest in supply functions prior to World War II, such work has suffered at the expense of more detailed firm analyses. It would appear profitable to plan research programs so that input-output data collected for firm analyses could be utilized to build aggregative supply and demand functions and to investigate questions relating to the competitive structure of the industry.

Information indicating the supply function of different areas will be needed. Obviously, the competitive structure of the industry is a dynamic phenomenon. Thus, technological advance and/or policy decrees can create shifts in the competitive position of an area, product, or individual farm. Knowledge of the impact of such innovations will be needed in the future by individuals, educational agencies and policy makers.

### *The Economy*

Agricultural economists have made outstanding contributions to a qualitative evaluation of the complex interrelationship of agriculture and other segments of the economy. The future will bring greatly increased demands for quantified estimates of these relationships. Emphasis should be placed (1) on studies of the efficiency of factor markets in effecting optimum flows of resources among areas and commodities within agriculture and between agriculture and other segments of the economy, (2) on analyses of the impact of alternative policies and programs on the structure of agriculture and interdependent industries.

If agriculture and the total economy are to achieve an optimum pattern of growth, policy makers must understand the operation of the important factor markets so that policy can be constructed so as to achieve transfers consistent with desired social goals. Research relating to the functioning of such markets must be expanded. In addition, agricultural economists should construct and evaluate alternative modification policies and plans.

Stine has suggested that economists have not made as great a contribution to policy making as they could have.<sup>12</sup> He points out that those

<sup>12</sup> O. C. Stine, "Mistakes and Lessons in Agricultural Economics in the Last 25 Years," *Journal of Farm Economics*, Vol. XXXVI, No. 5, December 1954, p. 815.



who stand by primarily to criticize or who base judgments on a "no-change" norm contribute little. There is a need for objective evaluations of the economic impacts of alternative policies on the economy, on the agricultural industry, and on individual farmers. Economic criteria are not the sole or necessarily the most important guide for selecting public policy relating to agriculture. Yet, a knowledge of the economic impact of alternative policies could greatly narrow the relevant area of consideration. I am impressed more by the diversity of opinions relative to economic effects of a given program than by the diversity of goals sought. This observation applies to both professional and nonprofessional literature.

### *Education, Service and Action*

Demands for research by educational, service, and action agencies will be similar to those enumerated in previous sections. Research specifically related to the determination of the manner by which managers acquire, evaluate, and apply knowledge could be useful to educational and action agencies. The same is true of investigations of different methods of teaching managerial principles to farmers. Each of these research efforts would require close cooperation with other disciplines such as psychology. There is even some doubt as to whether leadership in such projects should be in agricultural economics.

### *Research Techniques and Concepts*

The level of training of agricultural economists in economic theory and statistics is improving. This improved training will stimulate demand for improved concepts and empirical statistical techniques. Several problems will demand attention. I consider the most crucial to be (1) the development of an explicit operational unifying framework or theory to aid in identifying and formulating problems and in tying together analyses at different levels of aggregation into a meaningful whole, (2) development of an operational theory of decision making under conditions of risk and uncertainty, (3) development of empirical statistical techniques to improve our ability to quantify conceptual models.

There has been a tendency to over-segment our fields of interest. As a result our bits of research are extremely difficult to piece together. For example, farm management workers seldom extend their analyses to consider the aggregative impact of apparently optimum individual decisions. One major reason for this oversight is the lack of a general body of theory which in some sense allows us to unify our present firm and macro theories.

One could effectively argue that workers in production economics (and perhaps other agricultural economics areas) have been more successful in integrating ideas with physical and biological scientists than with other



subdisciplines within agricultural economics. This situation is again due, at least in part, to the lack of a unifying theory. Without doubt, we need specialists in the various areas of our field, but such specialists must view problems as a unit and recognize the relationship of special interest fields to the whole.

It has been popular to refer to agricultural economics as a profession of tool users vs. tool builders and as applied rather than fundamental researchers. The idea seems to be that once a person has been exposed to problems of the real world and has been involved in applied research work, he no longer has the ability to attack problems at the conceptual level. This being the case, we tend to look to the general economists for the development of the "pure" theory for use in solving our "applied" problems.

Certainly we must agree that many very productive applied researchers will never develop a new concept or empirical-statistical techniques. Furthermore, applied scientists have been able to make rapid advances in recent years largely because of the availability of basic knowledge accumulated over the centuries. In addition, we will continue to need pure theorists who will help insure against secular sterility arising from a lack of maintenance and enlargement of the foundations of our science. Yet, if our maturing profession is to continue to grow and to make the contribution it should, we must abandon the archaic idea that agricultural economists must depend on others to formulate their hypotheses and develop their analytical procedures. I fail to see how, other than by random choice, we can expect a pure theorist to make the modifications in theory needed to solve applied problems. We must devote resources to the development of needed concepts and methods. Further, I would argue that such development is most likely to come from persons sufficiently in contact with applied research to know what the real problems are.

Once new ideas and techniques have been developed, resources should be allocated to making them available in terms that are readily understood and applied by the typical researcher in agricultural economics. I believe we have an excellent example of the possibilities in this area from our experience with linear programming. Although programming is a relatively new development Heady has given the basic logic and computations involved, Boles has presented a simplified development of the mathematical basis of the method, Candler has explained how resource requirements may be varied continuously and French and Snodgrass have explained the transportation model. Each of these papers is written so that any researcher can understand and apply the techniques and its variations in his own research. Certainly these authors are to be

congratulated on making these powerful tools usable to the profession. More research of this order could be helpful.

### *Achieving the Optimum Allocation*

Even though we cannot explicitly anticipate the value of given research results, we must clearly consider alternatives, for over the foreseeable future resources to conduct research are likely to be small compared to the productive research opportunities. In fact, the opportunity cost of foregone alternatives is likely to be by far the major social cost of research in the years ahead. My own value judgments lead me to believe that in the future as compared with the past, we should allocate relatively more resources to problems of the industry and the economy and to the development of improved theory and techniques and relatively less to detailed firm studies.

This judgment is based (1) on the complementary relationship between the development of concepts and methods and the production of applied results, (2) on the fact that an unlimited amount of research relating to the firm will be of limited value in the absence of a rather sophisticated knowledge of interfirm interindustry relationships. Thus there is an important supplementary relationship between intrafirm and interfirm research with regard to resource use.

The felt demand for research at most state institutions has probably been for results that relate to individual farm management problems. Also researchers are better able to supply the less complex types of firm analysis. This, plus the fact that most researchers feel that their first obligation is to their state farmers rather than to their profession or society in general, probably accounts in large measure for the past emphasis on research at the individual farm level. Expressed needs may be an exceedingly poor indication of the real value or demand for the various types of research. Farmers and ranchers are becoming more interested in attacking their problems at the level of the industry and the economy and, in the years ahead, as the general level of economic sophistication increases, we will face demands for more research at the macro level.

Although demands for estimates of macro relationships will greatly increase, certainly demands for information at the individual farm level will not decline. As farm units become larger, the monetary importance of each decision will increase. If we are to provide the research basis for future decisions of individuals and society we must plan now how our resources can be reallocated to meet this future demand on the part of both individuals and society.

In general, I believe we have tended too much to look on individual

farm efficiency studies as entirely discrete and independent of analysis of interregional and industry economics. With the present general availability of high speed computers, the derivation of basic input-output data is clearly the most costly component of our research efforts both in terms of funds and time. By careful planning we can derive these basic relationships in such a fashion as to allow us to make inferences relative to important questions of individual firm efficiency, to provide area resource productivity estimates, to estimate area and industry supply and demand functions, and to analyze the impact of technological and policy variables on the competitive structure of regions and farms within the agricultural industry.

Although the results are difficult to measure in tangible terms, the various regional committees, particularly those sponsored by the Farm Foundation, have made significant contributions to the profession by greatly accelerating the spread of new ideas and techniques. In addition, these committees have stimulated individuals and groups to develop new ideas and areas of work. In the years ahead these committees can provide a vehicle by which the pattern of research resource allocation in the different regions can be greatly improved.

We must recognize that each individual agency and individual researcher faces individual allocation problems. There is no reason for all states and all individuals to engage in the same types of research. This is because the facilities and personnel available and the nature of the product demanded, varies greatly among the states. In fact, the tendency on the part of researchers to initiate and conduct research on the basis of a "follow the pack" philosophy can bring about a very poor allocative pattern. Schultz has warned us that,

Increasingly, as research becomes organized and institutionalized, it fails to stay abreast. This happens because research resources, once allocated, are not transferred to new types of study. Consequently there is a lag, and studies under way do not necessarily have the highest priority in their importance to the welfare of man.<sup>13</sup>

Agricultural economists can perform a very important function in the years ahead. In order to maximize our contribution, we should devote considerable group and individual thought to how we can best use our resources. In addition we should devote some research resources to the problem of deciding how research resources should be allocated. As a minimum, such an effort could delineate the major alternatives and indicate the major implications of the various alternative lines of research. However, the final allocation must rest on the systematic and careful evaluation of alternatives by the individual researcher.

<sup>13</sup> T. W. Schultz in the "Foreword" of *Farm Management Research 1940-41*, Bulletin 52, Social Science Research Council, New York, 1943.

DISCUSSION: OPTIMUM ALLOCATION OF RESEARCH  
RESOURCES IN A DYNAMIC AGRICULTURE

R. G. SPITZE

*University of Tennessee**Introduction*

It is a pleasure to comment on this paper for two reasons. I find Prof. Plaxico's statement a well-organized presentation exhibiting serious thought and personal interest in the subject. Secondly, the subject under discussion, that of the future use of our research resources, appears extremely vital to me. A field of science thrives or withers on the basis of the extent and substance of its research. I often suspect the rapid mushrooming our field has experienced is due as much to a blind faith of the public as to the unusual merit of our research performance.

Discussion assignments, such as this, often are reduced to either a series of gracious nods of approval or exhaustive inventories of phrases of petty disagreement. I shall try to steer a middle course in this particular case though it may not be my common *modus operandi*. My remaining discussion will relate to four topics.

*Treatment of Subject*

Plaxico chose an approach to the question of "whither shall our research resources go" not uncommon in our journals or on the platforms at our annual meetings. This involves a fairly inclusive survey of all economic problem areas in agriculture needing research attention. This approach usually seems to culminate in a plea for more research resources to be channeled toward all areas of agricultural economics. The accumulative result of funds and effort needed is staggering.

Realistically, the main stream of research activity continues to flow without great variation over time; such variations as exists exhibits a gradual reduction in one area and initiation of some pioneering research elsewhere with total effort swelling or diminishing according to legislative pulse. This stability is as it should be if our research is to produce fundamental results with a useful degree of generalization and remain immune to the fads of the day.

Hence, it would seem that analysis could be more fruitful on this subject if our attention would be focused upon those periodically emerging, strategic areas into which the profession must seriously consider moving. It is there where the marginal gain from our discussion and thought might be greatest and where ordinary analyses related to the existing body of research may not reach. Hardly need it be said that these new problems do not easily succumb to expeditious inspection. The long-run survival

of our profession rests upon the adroitness of these strategic redirections in our research effort.

### *Key Suggestions by Author*

I would like to further emphasize three areas or characteristics of research suggested by the author of particular importance, namely, more respect for the conceptual aspect of research, increased interdisciplinary activity, and examinations into alternative adjustments in the capital structure.

Conceptual formulation is contributory to an ongoing field of inquiry even though quantitative measurement of the postulated relationship is not yet available, as long as it directs fruitful inquiry into significant problems. Certainly, our very existence as a profession depends on continued development of more elaborate, more rigorous, and more useful concepts; such probably being indispensable to needed progress in the areas of decision making, economic development, and policy problems.<sup>1</sup> I seriously doubt that our institutional setting, largely public, of agricultural economic research is allowing enough margin for conceptual development. In addition, it may be threatened at its very roots, in our graduate programs, where theory is too often to be learned instead of developed.

Recently, strides have been made in interdisciplinary research effort, particularly, as the author points out, involving statistics and the animal and plant production fields of agriculture. Value can be added in our research also if we seek out the cooperation of the psychologist and the logician, whose study of the basic unit of economic activity, human decision and valuation, is hardly new.

Finally, the capital requirement for profitable farming promises to increase and the problems associated with capital acquisition will become more complex. Open minds and increased research effort will be demanded on questions such as the possibilities of greater reliance upon rentals, the place of a corporate financial structure, and the techniques for risk reduction.

### *Portions Less Acceptable*

First, Plaxico chooses to construct, admittedly with careful deliberation, a theoretical framework around which his analysis will take shape and by which the ultimate conclusions are to be molded. This is the "traditional and familiar supply and demand model." He then proceeds to characterize with precision the nature of his model with appropriate

<sup>1</sup> More elaborate development of this thesis was presented by Willard Cochrane, "Agricultural Economics in the Decade Ahead," *Journal of Farm Economics*, Vol. XXXVI, pp. 816f.



notations for the problem at hand. Suddenly, he recognizes that research results are hardly amenable to empirical manipulation desired for the model. Thus, he proceeds to examine research needs and possibilities in the foreseeable future without the encumbrance of a neat but perhaps superfluous model.

Irresistible as some of our basic theoretical models are, largely because they have proven so useful, I wonder at times if our profession is not likely to come down with "conformitis." To be respectable an analysis must commence and perhaps end with appropriate deference for selected jargon and models. Actually in this case, I feel Plaxico strove to offer a framework that he hoped would be useful, perhaps vainly.

Research needs would seem to emerge out of a survey of economic problem areas while research potential would be best recognized from scrutiny of our present capacities under alternative assignments. The particular allocation of resources at any time is a matter of judgment, in view of desired results, on the part of either the research worker, the administrator, or the citizenry. The author recognized this in his concluding section. Models and scientific generalizations can assist us immeasurably in predicting results of allocative actions, but offer little in the allocative choice itself.

A second characterization appearing, both implicitly and explicitly, and found disturbing to me was the normative use of economic theory. Major reliance seemed to be placed on the evaluative capacity of the theory itself to diagnose a desirable allocation of resources in some sort of optima or welfare context.

Theory indicates how objects or actions *can* fit together in a dependable manner, not how the action *should* be taken to be a desired one for the person or citizenry involved.<sup>2</sup> With this important but limited function of theory, the need is clear for improved theoretical tools. If the purpose of economic theory is thus viewed, perhaps the solutions to some of the problems in capital utilization, human resource transfer, and policy development could be approached more satisfactorily.

#### *Research Areas Deserving More Attention*

I would like to suggest two areas of research deserving considerably more attention than they now are accorded by the profession and by Plaxico's paper. I believe these are vital, not because of the ease with which they can be handled but because of the seriousness of the problems facing agriculture.

First, I think we need to make economic values and the valuation

<sup>2</sup> See K. H. Parsons, "Logical Foundations of Economic Research," *Journal of Farm Economics*, Vol. XXXI, pp. 656ff.

processes of farm people much more the subject of our theorizing and investigation.<sup>3</sup> People in agriculture are having to make evaluations about job alternatives, change of social patterns, migration to strange sections of the country, use of credit in capitalizing their business, producing for a strange market, and participation in policy decisions baffling even to astute students of government. If farmers are to solve these problems adequately in a dynamic agriculture, their values as well as their knowledge of farm and market organization must be appropriate to the occasion. I see no way for the income problem of agriculture to be resolved that excludes changing patterns of valuations. Our profession should be able to offer more assistance by determining the causes and consequences of existing values, by searching out the results of alternative values, and by enlightening ourselves and farm people more about evaluation processes.

Second, I believe more concern must be shown for the patterns and degrees of economic power with which farmers are faced in playing their role in a dynamic agriculture.<sup>4</sup> Economic power is being acquired rapidly through many means by buyer, seller, policy maker, and neighbor—with all of whom the farmer must negotiate in his climb to more acceptable economic gains. Our profession can offer more assistance in theoretical formulation and in factual findings by searching out the presence of such power relations facing farmers, in developing alternative means of increasing the economic power of agriculture, and assisting farmers to understand the results to be expected by the use of each. Sometimes I feel we are expecting to resolve the resource allocation problem, low-income problem, and policy dilemmas without altering farmers' values or changing power relations. I hope we exercise sober judgment before minimizing either.

<sup>3</sup> John R. Commons, *Economics of Collective Action*, New York, MacMillan Co., 1950, Chap. XI.

<sup>4</sup> Significant guidance on this task is offered by J. K. Galbraith in his *American Capitalism; Concept of Countervailing Power*, Boston, Houghton Mifflin Co., 1952, Chap. XI.

## HOW TO KEEP EXTENSION RESOURCES PROPERLY ALLOCATED TO A DYNAMIC AGRICULTURE

JACK CLAAR

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**K**EEPING extension resources adjusted to meet the needs of a dynamic agriculture is one of the challenging problems faced in extension work. To say that agriculture is "dynamic" is almost an understatement. The changes that are occurring may more properly be termed "explosive." These changes in agriculture, together with the prospects for continued change, indicate that the adjustment of extension resources will be a continuous need. Of course, the allocation of extension resources is a responsibility of administration. But they welcome, I am sure, the assistance of staff people in economics, in their role as over-all analysts. Economists can be helpful in projecting the problems of agriculture and in projecting the types of educational assistance that are indicated. The process by which needed changes in extension resource allocation can be discovered and brought about requires much economic subject matter and analyses. The purpose of this paper is to explore this real life resource maximization problem.

The Extension Service has an educational responsibility to all of the people, and its educational assistance is not limited to agriculture. A trend in recent years has been to provide more educational assistance and services to off-farm people. Examples of this trend are found in 4-H and in home economics work. A process of allocating scarce extension resources must be useful in guiding the distribution among all of the possible alternatives. The guidelines herein developed have such an application. The focus of this paper, however, will be on the problems of allocating extension resources to agriculture and to the closely associated environment, which has a direct bearing on the social and economic lives of rural people.

The primary function of extension work has always been that of bringing techniques and information to individuals and organizations in agriculture to solve their problems more effectively. Extension is tied closely to the problems of farm people on the one hand, and to research on the other. Thus, it is fitting that the discussion of how to keep extension resources adjusted should follow the discussion of the optimum allocation of research resources, as it is on this program. For the two are not independent. The fact that research resources in the land-grant colleges have been generally oriented toward technical production problems is undoubtedly a factor in the similar orientation of extension. That such an orientation exists in extension is indicated by the fact that approxi-

mately 70 percent of the states' specialist budgets goes for technical production and engineering specialists, and about the same percent of the county agricultural agents' time goes into planning and carrying educational programs relating to technical agriculture. One might develop the hypothesis, then, that county agent work with families is a function of the problems of farm people and the research and extension assistance available from the state university. The emphasis in research is likely to be reflected in the distribution of the state extension staff, which in turn tends to perpetuate the same program emphasis in county work. This is particularly true when work is "project" rather than "problem" oriented. One of the first and indispensable steps in keeping extension work adjusted to the needs of a dynamic agriculture is a research program that anticipates the problems of agriculture.

Several questions are considered. (1) First of all, what will agriculture be like "tomorrow," and what are some of the problems that agriculture will be facing? (2) What resource changes are indicated by these problems? What are the criteria that indicate when an extension program is in balance with the needs of agriculture? (3) What are some of the ways change can occur? (4) What are some of the roadblocks to change that must be by-passed or overcome? (5) And finally, what changes are occurring and what are some of the most promising avenues to further adjustments? These questions will provide the framework for this paper.

### *What Changes Appear Likely in Agriculture and What Problems Will They Create?*

Rather than attempt in this paper the gigantic task of preparing an independent projection of future developments in agriculture, some projections of others to 1975 will be taken as assumptions:

1. A growing economy will continue to provide employment opportunities for rural people and an increasing demand for farm products.
2. Low elasticities to income and price will exist in the main for farm products.
3. There will continue to be a decline in the number of farmers in agriculture, perhaps leveling off at about 5 to 7 percent of the population.
4. The growth of vertical integration as a form of business organization in agriculture will continue, moving into more enterprises. This vertical integration will take various forms; it will be in varying degrees, and will occur in both cooperative and other types of industry organization. The extent of present integration is not known and prediction of the degree of future integration is not available.
5. The trend toward business firms rendering more technical services to farmers will continue. Many firms and corporations are adding staff members whose primary function is to help farmer customers make effective use of their products. Thus, farm firms and the business firms that serve them will have more in common in the future.

6. Farms will remain basically family farms but will continue to grow in acres and in over-all volume of output.
7. Expansion of population and of cities and their facilities, will continue to create many urban-fringe problems.
8. The trend toward increased specialization in farm enterprises will continue.
9. Mechanization and over-all output per manhour employed in agriculture will continue to increase.
10. Increasing amounts of capital and capital per man will be used. Several predict the capital in agriculture will double in the next 20 years.
11. Interregional competition will become more acute.
12. Progress will continue in marketing technology and the utilization of farm products.

An analysis of these assumptions indicates some things about the problems agriculture will face. Probably most of the critical problems today arise directly or indirectly from the need to adjust to new technology and to the growth of our economy.

New alternatives are open to people, both in their economizing and in their social and cultural lives. In such a dynamic environment, the problem of making wise choices becomes one of overwhelming importance to the destiny of individuals and groups in agriculture. Rapid change in environment forces attention to adjustments; whether or not to farm, or to continue to farm, or to buy the adjoining 80 acres. Which of the new items of technology have a place on our farm, and what combination of them can be chosen to form a production process that will lower unit costs or increase net income? Which enterprises should be expanded in light of anticipated prices, costs, risks, etc.? These are but a few of the management problems that must be constantly faced in such a situation. The costs of mistakes are great because cash costs are high and decisions when made are frequently irreversible.

The securing of adequate capital to take advantage of new technology, of possibilities offered by economies of size, etc., will become of increasing importance.

The further merging of cities and rural areas will create more problems of both a social and an economic character. People near towns and cities will find their lives and problems becoming more and more like those of their city cousins, while the people in rural areas, where out-migration is occurring, will have difficulty developing or maintaining local institutions.

The problem of maintaining over-all economic growth is fundamental to the effective employment of resources released from agriculture. The ability of the nonfarm sector to absorb resources released from agriculture must go hand in hand with the increasing efficiency of agriculture. These assumptions indicate many problems that cannot be solved by



actions of the individual alone. A major problem of our time is how to influence the environment in which individuals economize so that choices made in the individual's interests are compatible with the interests of all.

As the environment of agriculture becomes more dynamic and complex, a knowledge of the forces that are operating to create change, and an understanding of the interregional relationships within agriculture and between agriculture and the rest of the economy becomes of increasing importance. Such an understanding is fundamental to recognizing the problems of agriculture. Such a grasp of the problems and economic forces is essential to successful business operation, as well as indispensable to taking an intelligent part in policy formulation.

Current production and consumption figures, and the income to agriculture, point up the important problem of marketing in the extension program. Increased utilization of farm products and increased efficiency of marketing firms are important to the future of agriculture.

#### *What Changes In the Allocation of Resources Are Indicated by These Problems?*

Discussion of assumptions and associated problems carries several implications for extension. The trend toward fewer farmers, bigger farms, and more specialized farms adds up to a higher percentage of better informed farmer-businessmen. The farmer who is content to get his information about farming from the butcher, the baker, or the candlestick maker will be hard to find. The pencil will guide more decisions and each farmer will be something of a specialist in his own right. When the trend toward increased vertical integration and increased consulting staffs by industry are considered, both of which provide technical services to farmers, the future county agent will be sharing the task of disseminating technical research information with many more people. Many of the leading farmers will want to get to the man who did the research, or at least to a highly trained extension specialist. Meeting this need may mean more associate county or district specialists in highly specialized counties. Many problems go deeply into the physical, biological, and social sciences. Obviously, an agent cannot be an expert in every phase of agriculture. He has to concentrate on problems common to the bulk of the people in the county and be back-stopped by experts for special problems. The problems of management and choice are common problems of all people. Focusing on teaching families, groups, and firms to be self-sufficient in recognizing and solving problems makes real sense in such a dynamic environment with so many problems and so many sources of information as we have today. This may sound like working oneself out of a job but experience indicates it doesn't work this way.

The county agent will move further into the economic and social problems of farm people, and toward more assistance to them in the process of problem identification and decision making such as helping individual families to make wise choices about whether to start farming or to continue to farm. The essential technical agricultural assistance that has contributed so much, and will continue to contribute to economic growth, must be better balanced by assistance to families and agribusiness in management, marketing, utilization of products, in choosing and changing vocations, and in meeting the changing problems of the rural community. More of the agent's time will need to be devoted to helping local people size up their situation, to recognize problems of both a micro and a macro nature, to study alternative solutions, and to support needed educational work to meet them. A county extension agent, broadly trained in the social sciences, would seem to be needed for such a task.

Extension specialists must be as highly trained as the research staff. More time will be spent with industry people who will be rendering more technical and management services to farmers. More time, particularly of economics personnel, must be devoted to training agents to carry people through the process of problem identification and analysis of alternatives. State specialists will also need to devote more time to providing agents with the information needed to make these analyses. To the extent that these assumptions are correct, adjustments of extension toward highly trained state specialists who make training and back-stopping agents a major job, and toward county agents who have more training in the social science field, would seem to be adjustments that would represent a "better" extension service. That is, one more in tune with farmers' needs.

#### *What Are the Criteria That Indicate When Extension Is Adjusted to the Problems of Agriculture?*

Proper allocation of scarce extension resources requires that the various alternative uses be valued relative to their contribution toward some goal or objective. For it is these objectives that form the basis for the criteria to be used in decision making. Society's goal for the agricultural sector would seem to be that of having a stable high-level agricultural production available at reasonable prices, which is produced with a minimum of resources and rates of return. This goal demands a transfer of resources when the compensation to marginal resources in agriculture falls below the marginal compensation of similar resources outside of agriculture.

Farmers usually say that their goal is the attainment of a high level of family living. Although not always vocalized by them, some thought

of a living level commensurate with their other alternatives is implied. This level of living is made up of both profit and nonmonetary satisfactions. Maximum satisfactions will be attained by some combination of the two. Extension's task in working with the family is to help them discover and to work out resource combinations that produce these goals in the proportion desired by the farm family.

The county or state that is attempting to adjust extension resources to people's problems is immediately struck with the wide diversity of problems. The social, economic, and technical problems involve the full range of subject matter. Some members of the group have the complementary resources needed to make full use of a large amount of educational assistance and are aggressive about obtaining it. Other individuals have the management and capital resources to use considerable help, but are less aggressive in making their wants known and must have help in applying knowledge to their problems. Still other groups do not possess the necessary complementary resources to use educational assistance in great quantities, or to obtain their desired standard of living in agriculture.

To serve the objectives of both society and individuals, extension education must meet the problems of these diverse groups. Accepting the goal of better family living temporarily, the first step would seem to be assistance to farm families in improving the use of the resources they control. This help, however, is most useful to those families who have the complementary resources to make full use of education. That is, those who have or can develop a going agricultural plant. Supplementing general educational work with more intensive personal assistance can be effective in helping some who are not able to obtain and to apply the information on their own. The achievement of a reasonable living in agriculture for the average may be impossible as long as so many units are in production and are dividing the agricultural income so many ways. The aggregate output of resources in agriculture, and the low price and income elasticities that exist in the main, make it obvious that work beyond the farm and home is a necessary corollary to work with individual farm families in improving the use of the resources they control. Extension commits many resources to work of this sort. Marketing and public affairs are examples. Certainly society has told us through the pricing system that its goal of maximum resource use is not being achieved. The concern of Congress, statements by farm organizations, the movement from the farm, income data from the Census, as well as direct contact with farm people, indicate that large numbers of families feel that their income goal is not being met.

Under the assumption of low income and price elasticities for the demand of farm products in the main, all of the educational work outlined

above may not be sufficient, in the period under consideration, to permit farm people to escape the treadmill of increased production efficiency bringing to agriculture a lower total income, unless the wish of society be attained that resources, freed by technological progress in agriculture, find employment at higher marginal rates.

This means that even a narrow goal of helping families in agriculture to achieve a higher level of living would call for a broad extension program that treats macro as well as micro considerations. This broadens the focus of extension to a concern for the economic growth of total economy and the relationship of the agricultural sector to it. The contributions made by various alternative uses of extension resources must be assessed. Imperical indications of the level of living, its distribution, and compensation of agricultural resources can be obtained. These help to assess the success of research and extension's educational program, but one must apparently rely on value judgments to arrive at the marginal contribution toward these ends of, say—adding another agronomist, sociologist, or specialist at the county level. Making these judgments is complicated by the fact that results are often intangible and uncertain. Interests conflict and the waiting period for fruition varies.

#### *Some Ways Adjustments Can Occur*

There are several ways adjustment can occur in extension work. The speed with which adjustment is made will depend to some degree on the way in which it occurs: (1) First of all, adjustments can occur by means of expansion. The basic allocation of present resources can remain about the same but more expansion can take place in areas where adjustment is needed. This has been the principal way adjustment has occurred. Adjustment of this type is, of course, contingent on additional funds being made available. (2) Adjustment can occur by redistribution of personnel between fields of specialization. Perhaps there are some states where certain areas of work claim too great a portion of resources. (3) The work emphasis of existing personnel can be varied. (4) The number of state specialists versus the number of specialists in a district or county may be varied. Highly specialized counties may need a specialist at the county level in addition to the general agent. (5) The methods by which educational work is done may be varied; i.e., mass media versus individual assistance.

#### *What Are Some of the Roadblocks to Change and Adjustment?*

In an on-going program several things develop that lend their influence for the status quo. These sometimes are quite formidable.

1. The first of these is the historical pattern. As mentioned earlier, county

agent work has been oriented toward technical production problems. This has naturally developed a training pattern in the land-grant colleges that is consistent with this orientation. It is human nature to give the most emphasis to areas of work where one feels the most competence. Thus, until training is changed, past emphasis tends to be perpetuated. Another roadblock that arises from historic relationships occurs when shifts in state specialist personnel are contemplated. If there have always been two specialists of one type and two of another, woe be it unto the administrator who attempts to make it three of one type and one of another. As long as a given state staff emphasis exists, it is likely that the county staff will carry the same work emphasis.

2. Pressure groups. The ever-present pressure groups of a democratic society play their role in extension, too. These groups play a role in bringing about adjustments. At the same time, they may not visualize the balanced pattern of educational activities that problems of farmers warrant.

3. Bias. Some administrators see certain problems more clearly than others and organize resources in the light of them.

4. The tendency to treat short-run "hurting" problems. The allocation of resources to broad, more intangible, subtle problems, is difficult because of the human tendency to prefer short-run tangible results.

5. Earmarked funds that may aid adjustment at one time may also prevent adjustment at another time, or lead to overexpansion along certain lines if changes in legislation do not keep pace with needs.

6. The tenure and inflexibility of staff specialists mean that shifts must occur slowly over a period of time.

7. Apprehension about branching out into untried areas, particularly if similar adjustments are not made by others.

#### *What Are Some Promising Avenues For Bringing About Adjustments?*

Extension has a record of being a flexible agency that is close to the problems of people. Its high degree of local autonomy creates an environment conducive to change in response to the felt needs of people.

A study of extension activities the last few years reveals that adjustments are occurring. Although the need to make available to farmers up-to-date technical information is still receiving its rightful recognition, increased emphases have been taking place on marketing, on public affairs, on work with consumers, on the growing problems of "rururbia" that require social as well as economic adjustments, on management through farm and home development, and on the special problems of low-income farmers. Shifts of this sort are in the direction indicated by farmers' problems.

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Extension administrators are concerned that further adjustments be made in extension programs that will permit extension resources to make their maximum contribution to solving the problems of people in the years ahead. As evidence of this concern, a work group was recently initiated by the Federal Extension Service in Washington to consider what some of the needed agricultural adjustments are, and to study how extension programs can contribute effectively to them. Back of this active interest is an increasing conviction that a program to serve the long-run interests of agriculture must concern itself not only with the problems faced by the individual producer or marketing firm in making efficient use of resources, but with problems of the aggregate as well; in fact, that the solution of industry problems is a necessary condition to the solution of many individual problems. As further evidence of extension's determination to meet this challenge, an effort is under way across the country, through extension program projection, to provide an opportunity for local people in counties to study their problems, to express their needs, and to take part in designing programs to meet their needs.

The most promising avenue of keeping extension resources adjusted to educational needs would seem to be through the council of large numbers of people broadly representative of agriculture and the firms and organizations that serve it. Before adjustments can be made, expectations must be formed as to what the educational problems will be that rural people need help with, and value judgments must be formed as to the kind of help that will make the greatest contribution to the accomplishment of objectives.

An adequate basis for such decisions cannot be formed by just getting people into a room and asking their opinion about these things. Experience has shown that such groups tend to take a narrow look at their problems and that there is a tendency to weigh problems that promise short-run, tangible results very highly, while the big problems, that may take a longer coordinated attack to solve, frequently receive less emphasis. Value judgments that form the basis for extension resource allocation must be formed through a more systematic approach to the problem.

This requires that a cross section of people be armed with well-analyzed and well-interpreted facts that permit them to size up their social and economic situation, to identify and weigh problems, and to study the effects of alternative courses of action. Only after people have experienced such a process will their value judgments become useful as a guide to the allocation of extension resources.

The economist must play a key role in furnishing materials and in training agents, if we are to attain the goal of well-informed groups of rural people who can be fully helpful in guiding extension programs. In his role

as an over-all analyst it becomes his task to assemble, interpret, and analyze some facts that bear on the situation, and to help train and guide the agents and local groups in collecting and making effective use of other needed information. His task is to help county groups to think "big," and to consider such problems as the future competitive position of their area with respect to various alternative enterprises. The subject matter needed for this task must come from many areas, but it must be analyzed and interpreted to be useful to committees. The economist must also carry a role of training agents in the process itself for the economists' tools of analyses and techniques are needed in this decision-making process.

The translation of these informed judgments to adjustments in extension must be the final step. This requires a clear channel to extension administration. Although the allocation of extension resources must finally rest with the director of extension, the people whom the programs are to serve are partners in this task. This perhaps increases the responsibility of administrators to consider the degree of short-term local bias that may exist, and to correct biases that may be present in requests in case those asking are not well informed, or are not fully representative, or are dominated by some strong group or organization. One concern of this sort is that part-time or very low-income farmers may be difficult to contact and their needs and problems may not be fully reflected. Another is, that some problems cut across county lines and a broader approach is needed to develop adequate programs. This is probably true of many marketing problems. For these reasons, the director probably cannot rely solely on county requests to guide resources. He must also carry on a planning process from his vantage point of the state as a whole, making certain that important problem areas are covered as indicated by analysis. But, even with these risks, this would seem the most hopeful route that exists to provide the basis for continued adjustment of extension programs. Finally, then, in program development there must be a merging of the ideas of farm people, of firms and groups in agriculture, with those of the professional extension personnel who must make the decision. These experts in extension have a contribution to make. They are in the best position to see the whole job of extension and to merge the requests into a program that insures both continuity and breadth. In making these decisions it would seem important that extension administrators involve representatives of the groups who have been involved in the process and who have made requests. By being involved they will understand better the basis of decision and the compromise that must be made.

With such a process of problem analysis operating effectively, the extension service would be change oriented as well as problem oriented. Under these conditions, where local people guide program adjustments, many

of the impediments to change will be diminished. The initiators of change will be rural people, thus lessening the rigidities created by the historical pattern. Through this process the tendency to want only programs with quick, local, tangible results would be somewhat reduced and the director's hand would be materially strengthened in discussions with pressure groups. Through the use of local people as partners in the task of allocating resources, administrative bias would be minimized. The activities of extension in program projection is a hopeful step, but a comparison of many of the county programs developed to date indicates that the job of analysis and interpretation that is needed to identify and weigh problems needs to be done better in order for the scientific process of analysis to adequately occur. The historical county program and bias toward the obvious tangible problem are still evident in too many of them. This probably results from the shortage of manpower at the state level whom administrators can assign to the task of providing materials and training agents and groups in effectively using the process. But it is a significant start in the right direction and offers the framework for improvement.

Recognition of the farmer's growing problem of management and decision making is indicated by extension's efforts in farm and home development. This offers an opportunity to extension to work with farm families on a problem rather than a project approach, and to put technical production and homemaking information into a management framework. Another promising avenue to making needed adjustments in extension education is extension's part in rural development. The rural development program recognizes that many of these problems must be attacked on a broad base by local people, and that work in helping individuals to recognize their limitations may be fruitless unless we also help them to find realistic alternatives.

Another promising avenue of extension resource adjustment is increased emphasis on programs of economic information, which is aimed at raising the economic literacy of farmers so that they can understand the forces that are operating and take a more informed part in policy development.

In considering the ways that adjustments in extension work are likely to occur in the near future, two avenues stand out. The first is the re-orientation of county agent work in the direction indicated—this would include more work on decision making and on the economic and social problems of communities, as well as spending more time working with groups in problem analysis. The speed and degree of this re-orientation in county extension work is related to the training given agents, both of an in-service and formal nature. Running concurrently with this, more technical agricultural specialists are likely to be assigned at the district or the county level in certain specialized counties. The second promising avenue

of adjustment is by greater rates of expansion in areas that need strengthening. There do not appear to be many states where any large amount of specialist reassignment can be made.

People outside the state can make contributions to this adjustment process, particularly in overcoming the problems of bias and natural closeness to the problem. The federal office of the extension service, organized groups, and occasionally professional evaluation services, should be called upon as counselors. Only by aggressive work on the problem can we keep abreast of the fast-changing scene and provide rural and urban families with the educational assistance of which extension is capable. An aggressive extension service is needed that is change oriented and dedicated to developing educational work that will be fully helpful in facilitating changes in agriculture, to increasing the levels of living for farm families, and to bringing about equi-marginal rates of compensation for resources within agriculture and between agriculture and the nonfarm sector. Meeting this challenge will require the allocation of resources in aiding agriculture to reach high levels of efficiency, in helping agriculture make adjustments to meet its problems, and in the economic growth and development of the economy as a whole.

#### DISCUSSION: HOW TO KEEP EXTENSION RESOURCES PROPERLY ALLOCATED TO A DYNAMIC AGRICULTURE

W. F. HENRY

*University of New Hampshire*

Mr. Claar has prepared an excellent paper on the use of extension resources, but since little purpose would be served by my discussing those points with which I agree, I will confine my remarks to what appear to me to be three areas of disagreement either in terms of substance or in terms of emphasis.

##### *Extension Objectives*

A very important decision concerning the future of the extension service is the extent of its activities. The educational responsibility of the extension service is spelled out in the Smith-Lever Act of 1914, which says in part: "... That in order to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to encourage the application of the same, there may be inaugurated in connection with the college . . . agricultural extension work . . ."

This directive has been interpreted in many ways over the past 40 years. One of today's most popular interpretations was given by Claar

when he stated that extension has an educational responsibility to all the people, and that extension should provide rural and urban families with educational assistance. He did not follow this broad avenue very far but confined himself to work in agriculture. Even here, however, he found many and varied ways in which extension could pursue its work.

It is time to take a good look at the basic objectives of extension, especially in studying the proper allocation of extension resources, to decide what extension should be doing. Claar states that "a process of allocating scarce extension resources must be useful in guiding the distribution among all the possible alternatives." The real question to start with is: what are all of the possible alternatives? Or more precisely, what are the fields in which it is reasonable and proper for extension to work?

Obviously, extension cannot be all things to all men, so must decide what it can be and to whom. Since extension is financed from the public treasury in one way or another the idea that it should contribute to the welfare of all the people of the country seems appropriate. How this can best be done is dependent on the social ends of the nation. I do not propose to deal with them here except to take the position that one social end which appears to be desired by most people is increased resource use efficiency in the production and marketing of agricultural products. The promotion of this improvement in efficiency is, I believe, the prime objective of the extension service and carries out the directive of the Smith-Lever Act to diffuse "useful" information. Therefore, movement into urban areas, into youth activities, into community affairs, and so forth may very well be inappropriate uses of extension's resources. Care of lawns is not a matter of agricultural resource use efficiency, nor for that matter, of home economics.

A different kind of look at the objectives of extension is also provided by Claar when, confining himself to agricultural work, he states that the job of extension is to serve the objectives of both society and the individual. Society's objective, he thinks, is to have stable high level farm production at reasonable prices, while the objective for the individual farm family is better family living. These two diverse objectives, he feels, must be served by the one agency, and this of course is an impossible job if extension stays within the confines of the agricultural industry. Claar recognizes this but believes this untenable situation forces extension to broaden its program so as to deal with the total economy in such a way that resources in farming and in the rest of the economy receive equal marginal returns.

My concern here is that Claar makes it sound too easy. His two headed job for extension is, I believe, highly unstable—it turns out that one objective or the other is served. Through the years, whether we like it or not,



extension has served almost exclusively society's objective for abundant, cheap food. The farmer's objective of high income has not been met, largely because of immobility of farm resources, especially for established farmers. Most mobility occurs when young people prefer to leave farming. Encouraging this movement must come early and is probably the responsibility of state and local agencies through regular education channels. Extension responsibility might best be described as negation—that is, not carrying on activities that encourage young men to farm.

### *Changes in Agriculture*

As Claar has pointed out, the problem of properly allocating extension resources is very complex in light of the dynamic nature of agriculture and the rest of the economy. He says that "Probably most of the critical problems today arise directly or indirectly from the need to adjust to new technology and to the growth of our economy." This idea certainly commends itself as a generalization with considerable validity; but I believe that equally important forces for problems and maladjustments are the changes in the structural features of the several agricultural industries, particularly in the marketing of farm products and farm services.

Until now, agriculture has been the sleeping giant among the major industries in our economy. It has been for some time the only competitive industry, characterized by a very large number of very small independent units, each carrying on its own function of decision making in complete disregard of the effects on anyone else. This is a prime reason why extension has been able to effect such marked changes in efficiency in farming.

We are now faced with the probability that those firms servicing agriculture, either as receivers of farm products or suppliers of farm inputs, are no longer content to deal with agriculture in its present atomized state. For these firms too much is left to the vagaries of competition, so they do two things: (1) take decision making out of the hands of the individual farmer, and (2) use all possible devices to compete with other firms. The first is being handled by so-called integration, the essential part of which is the movement of decision making to the parent firm, so that some element of monopoly control over production and marketing is attained. The second is being handled in part also by integration but at present to a great extent by the field men of the business firms. A sign of the times and of the type of work these field men are asked to do is that hiring firms prefer men with some training in business and salesmanship—these men are not so much technologists as they are competitive arms of the firms employing them.

This leads me to the point that the new feature of agriculture in 1975 will be decision-making control by firms servicing agriculture, and a large

amount of competition among these firms to maintain volume and strength. For the extension service this means (1) dealing with a new dimension in agriculture with which it is not now at all familiar nor indeed prepared to cope and (2) a greatly narrowed base of farmers with whom extension can work.

### *Allocation Process*

The last quarter of Claar's paper discusses the mechanics by which extension resources can be kept properly allocated to a dynamic agriculture. The one he deals with quite extensively is the use of broad-based lay committees in directing extension work.

One of the major difficulties involved with the use of broad-based committees, and this is pointed out by Claar, is their bias toward the short-run and local in delineating problem areas, and toward the technical as distinct from the more politically unpalatable economic and social problems. In addition, and most important, I question whether extension can continue to expect assistance from farm leaders in planning programs in such a way that these programs will promote efficiency in agriculture, which in essence means reduced farm income. In a recent editorial a young Iowa farmer suggests: "Let's tell our farm magazine editors that we are getting fed up with constant urging to adopt improved practices which will increase total output at a time when most farm products are out-running markets." Incidentally, this same sentiment was recently voiced by the House Appropriations Committee.

Such broad-based committees can be of some aid to extension in discovering the problems that concern local farm people. But the main objective of the extension service to improve the use of resources in the production and marketing of farm products stems from a mandate from all the people, so the primary responsibility to decide how best to serve this objective rests on extension.

## EVALUATION OF AVAILABLE DATA FOR ESTIMATING MARKETING SUPPLIES AND PRICES OF HOGS AND CATTLE

Chairman: W. J. Ebling, Federal-State Crop Reporting Service, Wisconsin

### EVALUATION OF AVAILABLE DATA FOR ESTIMATING MARKET SUPPLIES AND PRICES OF HOGS\*

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**E**VALUATION of data for estimation of market supplies and prices depends on the following: (1) the forecasts made or needed to be made; (2) the economic models and the types of method selected; (3) the variables in the formulated models; and (4) the data available to historically describe the variables. From this, one can then evaluate existing data and make recommendations concerning what data should be collected in the future in order to obtain better forecasts of supplies and prices of a commodity.

#### *Forecasts Needed*

Forecasts of market supplies and prices of hogs are needed by both hog producers and meat packing firms. Knowledge of future supply and demand conditions by all parties leads toward a more efficient marketing system. In a free enterprise economy, faster price discovery results in faster adjustment of production programs by farmers and faster adjustment of supply and demand factors. Reliable supply and demand information allows marketing firms to more accurately plan their future buying and storage programs. Hildreth and Jarrett<sup>1</sup> state that "if farmers could more accurately forecast price and cost conditions, they could more efficiently adjust their production. If processors had better notions of the amount of various animals and products that would be forthcoming, savings in processing costs would undoubtedly be possible.

Farmers need price forecasts each time they make either a marketing or a production decision. A hog producer usually had a period of up to 45 days in which he can market butcher hogs. During some seasons of the year he will usually net a greater return from marketing at a lower weight while during other periods he will usually gain by feeding to higher

\* Purdue University Journal Paper No. 1163.

<sup>1</sup> C. Hildreth and F. G. Jarrett, *A Statistical Study of Livestock Production and Marketing*, John Wiley and Sons Inc., New York, 1955, p. 1.

weights. Good predictions of price movements during the month or two after his hogs weight 180 pounds would aid the producer in making more profitable marketing decisions.

Longer-run predictions of prices a year or more hence are required in making the best production decisions. Whenever a farmer breeds sows or gilts he should estimate the likely return some nine months to 14 months in the future, as well as his feed costs and other alternatives.

Meat packers and processors are more interested in future supply than in price forecasts. They do not sell hogs but pork products and are more interested in future prices and supplies of pork products than in hog prices. However, good estimates of hog supplies on the market are necessary for the packer to plan his needs for labor, his other inputs such as supplies and containers and his advertising and sales programs. Knowledge of future supplies of hogs is required since they are closely associated with future pork supplies which affect the price of pork products he sells or may store. For storage decisions, he may need estimates of supply and price many months hence. Better knowledge of future supplies may also aid the packer in making decisions concerning building, expanding or remodeling his facilities.

The predictions most needed by farmers include price movements in the very short run up to six weeks or two months and price predictions nine or more months in the future. Price forecasts for all future periods are also needed by farmers in that they affect future cyclical supply and price changes. Most processors have greater need for supply predictions from the very short run up to nearly a year in the future.

### *Models and Methods Employed*

The most important requirement for good price or supply forecasting is a good economic model to realistically portray the economic relationships involved. A very simple model would be that the price of hogs during time period  $t$  is a function of the number of hogs marketed during time period  $t$  plus an error term. This model is realistic because the number of hogs on the market during any particular time is one of the principal factors in determining the price of hogs. The model would probably not be too precise, however, since there are many other factors involved in determining the price of hogs. Fox has described an economic model including 17 separate variables.<sup>2</sup>

Methods commonly used in everyday prediction work include tabular and graphical techniques. These methods have the advantages of speed and simplicity while maintaining the ability to give fairly accurate esti-

<sup>2</sup> Karl A. Fox, *The Analysis of Demand for Farm Products*, Tech. Bul. 1081, USDA, 1953.

mates of relationships among variables in the model. Other methods include more complex mathematical and statistical procedures requiring calculators and computers. These methods require more time and are more expensive but are capable of yielding more precise estimates of relationships.

The kind of method employed and the complexity of models cannot be completely separated. It is very difficult to use a highly complex model in graphic and tabular techniques. However, some of the mathematical methods with modern electronic computers may allow one to use a very complex economic model.

The most important phase in economic prediction of prices and supplies is the development of the model—one that is realistic and fits the hog economy. Accurate data must then be available in order to describe recent relationships among the pertinent variables. A method must then be selected to obtain estimates of these relationships. Regardless of the complexity and refinement of the method, the resulting predictions will be no better than the model and data used. Stephen M. DuBrul,<sup>3</sup> an economist with General Motors, says that to apply highly complex techniques to the rough data that are available is "gold-plating crowbars."

### *Variables Employed in the Models*

#### *Supply models*

Forecasts of hog supplies are dependent upon good predictions of earlier pig crops. The most important factor associated with the supply of hogs during a particular time period is the number of pigs saved the previous 5 to 10 months. As the time period becomes very short, movement of the current price of hogs becomes an increasingly important variable on the number marketed.

Other important variables are the average weight of hogs marketed, the percentage of total marketings as sows and the hog-corn ratio. These help describe differences from year to year in the average length of time required between the farrowing and marketing of hogs, the amount of liquidation of breeding stock, current price of hogs and other factors.

#### *Price models*

Exogenous variables affecting the demand for pork and lard are more important in predicting hog prices than in predicting hog supplies. However, for all time periods, changes in hog marketings are associated with changes in hog prices.

The most important factors in predicting average price of hogs for a

<sup>3</sup> "Business Forecasting," *Business Week*, September 24, 1955.



year are hog marketings, consumer disposable income, the price of fats and oils which compete with lard and the production of corn.<sup>4</sup>

The most important factors in monthly hog price predictions are hog marketings, changes in the price of fats and oils, estimates of future hog marketings, amount of pork in cold storage, changes in the average weekly wage of industrial workers.<sup>5</sup> The relative importance of these factors varies during different seasons of the year.

#### *Data to Historically Describe the Variables*

Accurate data for a sufficiently long time period are required to historically describe the relationships between the independent and dependent variables. If these data are not accurate, true relationships among variables cannot be known. The data for each variable must be available for at least a certain length of time in order that the model can yield maximum forecasting results.

In practice the data must also be timely. For example, some of the pigs saved in December are already marketed before the Pig Crop Report is released in late June with information for the researcher on December farrowings. Estimates of hog slaughter must be made as soon as possible so that the prognosticator may continually check his original slaughter predictions. If his estimates are consistently too high or too low, he should reevaluate the factors involved.

#### *Data Now Used*

Much and varied data are now used in attempting to forecast changes in hog supplies and prices. Much of these data concern exogenous variables that have an important effect on hog prices and supplies. The evaluation of these is outside the scope of this paper.

Probably the most used and the most useful set of data is that collected by the United States Department of Agriculture in the *Pig Crop Survey*. This is a mail survey of nearly 150,000 farmers conducted throughout the United States every December 1 and June 1. From the sample, the Department estimates the number of sows farrowed each of the last six months prior to the time of the survey, the average number of pigs saved per sow during the past six months period, the intentions of farmers concerning the number of sows they intend to have farrow during the following six months, and the number of hogs on farms within certain age classifications.

<sup>4</sup> C. B. Cox, and P. J. Luby, *Hog Prices*, Bulletin 627, Purdue Agricultural Experiment Station, June, 1955.

<sup>5</sup> Unpublished thesis, "Methodology Applicable to Short-Run Prediction of Marketings and Prices of Hogs," P. J. Luby, Purdue University, August, 1956.

During the last several years a federal-state quarterly survey has been initiated in eight Corn Belt states. This survey is conducted each March 1 and September 1 and covers states that produce about 70 percent of the hogs in the United States. The data collected are about the same as in the semiannual pig crop survey, except that monthly estimates are not made.

Other data useful and important in forecasting hog supplies and prices are marketing, price, and slaughter statistics. Statistics concerning marketings and slaughter of hogs are necessary to check earlier forecasts to see if they are running above or below earlier estimates. Thus, these data must be current and accurate.

Probably the most used slaughter statistics are data on the number of hogs slaughtered under federal inspection. At the present time about 83 percent of total pork production in the United States is federally inspected.<sup>6</sup> Other useful market and slaughter statistics include the estimate of total commercial slaughter by months and numbers marketed on public markets per day, week, month and year.

Among the most useful price series is the average price of barrows and gilts on eight leading Midwest markets released weekly, monthly and annually by the USDA. Other price statistics include the average of the weekly range of prices of hogs by weight groups on principal markets, and the average price received by farmers for hogs, by state, month and year.

#### *Evaluation of Present Hog Data*

The recent addition of the federal-state quarterly *Pig Crop Report* in eight states has strengthened the value of the pig crop survey. However, these data are still inadequate in several respects. The large revision in the 1951 through 1954 pig crops after the 1954 agricultural census, makes it evident that the data that we attempt to use with precise statistical techniques are quite rough. There is evidence that the year-to-year changes reported by the pig crop survey have been quite accurate. However, the 1955 spring pig crop was probably underestimated when spring farrowings and the following winter marketings for the past few years are compared. The 1955-1956 winter marketings were somewhat larger than would be expected from reported 1955 spring farrowings even after allowances are made for some liquidation of breeding stock.

A few of the hogs reported in the semiannual pig crop survey have already been marketed before the report is released, which is nearly seven months after the beginning of the period covered by the report. No estimate of pigs saved per litter per month is obtained, and the monthly estimate of the actual pigs saved may have a somewhat different pattern than sows farrowed.

<sup>6</sup> C. W. Estes, "Number of Livestock Slaughter Establishments in the United States, March 1, 1955," *Livestock and Meat Situation*, No. 78, July 8, 1955, p. 21.

Current accurate estimates of slaughter are available only on federally inspected slaughter which makes up only about five-sixths of the total. Very little is known about non-federally inspected commercial slaughter and even less about the seasonal pattern in farm slaughter.

### *What Is Needed*

For longer run predictions of more than six months in advance, probably no new kinds of data are needed. More accurate estimates of pig crop reports appear to be the most valuable addition that could be made to current data. More accurate and more timely data on pig crop, slaughter and price, are required for shorter run forecasts of prices and slaughter. However, it cannot be overemphasized that even with perfect data, hog price predictions would still be subject to considerable error. Progress in obtaining accurate data on demand variables and predictions of movements in consumer demand appear to have lagged behind progress in obtaining data on and predicting future supplies of hogs. However, more frequent and accurate data would greatly improve slaughter forecasts.

One of the most important data requirements is accurate pig crop surveys. Our national semiannual survey should contain the number of pigs saved per month and pigs saved should be clearly defined. Needed in conjunction with the national survey is an accurate estimate of the average age at which market hogs are sold in various sections of the country. Thus, when regional changes in hog production occur, the effects on the timing of hog marketings can be better ascertained.

The federal-state quarterly surveys should be extended to cover at least 90 percent of the total hog production and should contain information concerning monthly estimates of pigs saved and monthly intentions of farmers to have sows farrow. Accurate information on these factors would give current checks on the most important variables used in short-run and intermediate-run price and supply forecasting in hogs.

Accurate estimates of weekly commercial hog slaughter along with their average weight would be a most welcome addition to data available for researchers. The speed with which this estimate is released is important as it is often used as a check by those who are concerned with estimating supplies and prices in the short run. At present, the weekly estimates of federally inspected meat production are released the following Wednesday. These estimates could be made to include all commercial slaughter and be released within a few days. In addition to this, an accurate estimate of the seasonal pattern of farm slaughter would be helpful.

There are several additions to our data which I believe would prove useful to those making supply and price estimates. Since 1954, some of the members of the American Meat Institute have sampled their slaughter hogs to get a monthly estimate of the number of barrows and the number

of gilts slaughtered. It is too early to fully evaluate the usefulness of these statistics in estimating future hog supplies. However, it appears that about a thirteen month lag exists between changes in the farmers' pattern of marketing or holding back gilts and a corresponding change in the number of butcher hogs marketed. Prior to July 1943, federally inspected hog slaughter was classified by barrows, gilts and sows, and stags and boars. If the present data could be collected to separate barrows and gilts these slaughter data may be very useful in forecasting longer run changes in supplies and prices of hogs.

The separate reporting of the average weight of barrows and gilts and sows slaughtered in the United States would be helpful. During certain periods of the year, average weight of these classes sold through the eight large Mid-Western hog markets is not representative of the total slaughter. Lack of such data makes it more difficult to predict total pork production in the very short run.

Price changes during the very short run (within a week or so) seem quite erratic and often are closely associated with abrupt changes in the price of pork products. Perhaps some kind of report on meat inventory in wholesale channels as of Wednesday could be reported on Friday to measure movement of meat. Such an inventory would have to be of major pork cuts and might be very helpful in measuring short-run changes in demand for pork cuts and possible changes in the demand for and price of hogs during the following week.

This paper has attempted to evaluate data available for forecasting hog prices and slaughter and to suggest improvements in the type of data collected. In view of the researchers' tools and techniques available and the needs of prediction by producers and processors, I believe such improvements would greatly facilitate more accurate hog supply and price forecasts.

#### DISCUSSION: EVALUATION OF AVAILABLE DATA FOR ESTIMATING MARKET SUPPLIES AND PRICES OF HOGS

H. J. Houk  
*Armour and Company*

After listening to the innumerable inadequacies of our basic livestock statistics, I am going to make certain that our management at Armour does not see copies of the three preceding papers; otherwise, I am certain I would have to close my shop and seek employment elsewhere.

Luby presented a comprehensive analysis of the available data for estimating market supplies and prices of hogs. Let us review again one or two of his statements regarding the need for hog and pork forecasts.

"Forecasts of market supplies and prices are needed by both hog producers and meat packing firms." I do not quite understand why he omitted wholesalers, retailers, exporters, and various departments of our federal government, especially those in the executive and legislative branches. Included also should be representatives of foreign governments, particularly those astute individuals who time the expenditure of their P.L. 480 funds for lard when lard prices are at the seasonal low.

The very foundation of Luby's paper is that "faster price discovery results in faster adjustment of production programs by farmers and faster adjustment of supply and demand factors." Improved timing in the release of basic pork data is the most important need we have today.

Let us examine two striking examples in which the release of the pig crop report influenced the price of hogs.

On June 22, 1955, at noon the spring *Pig Crop Report* was released. This indicated an increase of 9% from the preceding year. During the following 12 marketing days, top hog prices at Chicago declined from \$22.75 to \$19.00—almost \$4.00. The price decline continued through July into August. This was a surprise to many producers, traders and others closely associated with the hog industry, many of whom were expecting the price advance to continue well into July with increases of from \$1.00 to \$3.00.

Examination of the background of the situation leading up to June 22 reveals the following:

1. Intentions as of the preceding December indicated an increase of the spring pig crop of only 5%.
2. On March 12 a trade paper reported that marketings during July were likely to decline sharply from the May-June average with a substantial price increase anticipated.
3. On March 24 the Illinois Crop Reporting Service released the 6-state quarterly pig crop survey, which indicated that the spring pig crop might be somewhat higher than earlier intentions—up 7% for the 6-state area.
4. On June 11 a well-known trade letter projected a price advance of \$3.00 cwt. into the July summer peak.

A detailed study of the June pig crop clarified the surprise. Monthly data, which first became available on that day disclosed that December farrowings were up 22%, January 41% and February 15%. It was the movement to market in June and July of these pigs born during December and January that brought about the sharp price decline.

Another example was this year. Spring farrowings were down 3%, which was about the same as indicated by intentions last December. However, during the winter the hog-corn ratio became quite favorable, and most producers as well as analysts were expecting the crop to be higher than indicated by the December intentions. In other words, a repeat of the 1955 experience was anticipated.



On April 13, one trade report stated that a level of \$19.00 to \$20.00 by late June or early July was likely. Hogs at that time were \$18.75. As most of you know prices continued to advance above that projected high and by August 1 were \$23.35 cwt. at Chicago.

Again the price movement was understood after we had an opportunity on June 21 to find out how many pigs were born the previous December and January.

The above two examples exemplify the great need for improved, expanded and more frequently released basic hog statistics.

An examination of the changing seasonal of pork production also points out the need for modernizing our procedures for obtaining needed data. For example, in the early 1930s, 14% of the spring farrowings were in the months of December, January and February. For the 1957 spring crop it was 33%. The changes in recent years have been substantial. If the present rate of change continues, by 1962, 43% of the spring pig crop will farrow during these three months.

The revolution now occurring in the seasonality of pork production is comparable to that in the broiler industry a decade ago.

You may be interested in learning how we at Armour use the pig crop data. It is the foundation of our analytical work for pork. Long and short-range slaughter forecasts are prepared. Since slaughter in our plants during the winter peak is three times the quantity of the summer low, there is need for planning ahead. You can visualize the tremendous problem of building up our work crews, preparing our facilities both production and distribution, planning for transporting the product, advertising programs and ordering supplies. For one item, cans, our purchases are of the magnitude that we are the third largest customer of a major can manufacturer.

Our inventory programs for accumulation and liquidation are based almost entirely on anticipated slaughter. This year the industry underestimated the need for product this summer because of inadequate information as to the number of pigs born last December, January and February.

Pig crop data released more frequently would be beneficial to all segments of the industry, including producers, transportation agencies, processors, retailers, and consumers. Wide seasonal and cyclical swings in hog production and marketings can be reduced by multiple farrowings and more orderly marketings.

We would like to suggest that data for a monthly pig crop be assembled in much the same manner as for dairy and poultry. The present pig crop survey accumulated by mail under the direction of state statisticians could probably be expanded. This would cost less than other methods and can be accomplished with a modest increase of funds for the state statisticians.

## AN EVALUATION OF AVAILABLE DATA FOR ESTIMATING MARKET SUPPLIES AND PRICES OF CATTLE

J. RUSSELL IVES  
*American Meat Institute*

I WOULD like to begin this paper by noting that the people who are most interested in the subject of livestock statistics fall pretty well into two categories—(a) Producers of the basic data; and (b) the users of these statistics.

Those of us who fall into the second category of users or analysts of the cattle data are impressed, I think, by the numerous blind spots that exist in the information with which we have to work. However, I shall not use these remarks merely as an opportunity to be critical of the efforts of our friends who are in the business of producing our "raw material." The job of making the estimates of cattle production, inventories, marketings slaughter, etc., is an exceedingly difficult one, and I have the impression that the analysts have not been as helpful as they might have been on this side of the picture.

I suspect, for example, that many of us have been content with more or less superficial analyses capable of arriving at only directional predictions. Many times, in fact, we have merely parroted the reports themselves, and we even suggest to the USDA that we would like to have more surveys of marketing intentions, which we can use as a substitute for our forecasts based upon our own analysis of the basic production data. I'm sure that I am not alone in the opinion that of all the cattle data the Agricultural Estimates Division publishes, marketing intentions have the least likelihood of adequate accuracy. Therefore, it seems to me that resources utilized in the collection of such data might be better spent in developing information that is more subject to accurate measurement.

### *Problems in Estimating Cattle Statistics*

Before considering further some specific aspects of our available statistics on cattle, it may be worthwhile to examine briefly some of the problems involved in the development of this information. I have two points in mind: (a) the physical nature of the cattle industry itself, and (b) the related problems of definition.

In reviewing some of our research preparatory to the drafting of this paper, I became more than ever aware of the fact that the cattle and beef industry is peculiarly resistant to statistical description, either on an inventory basis or on the basis of what has happened to production and marketings over a period of time. By the phrase, "statistical description,"

I mean to include somewhat more than just "statistical measurement," because we need to know rather clearly what we are measuring if the measurements are to be meaningful.

Our statistical difficulties arise mainly from the twin facts (a) that cattle are not produced and marketed as an annual crop, and (b) that we are not dealing with a single, homogenous commodity. Instead, the production process can be as short as a few weeks, as in the case of veal calves, or as long as 8 or 10 years, in the case of cows culled from breeding herds. In between these two extremes is the bulk of our beef supply which goes through various degrees of feeding and which may take as little as 90 days or as much as 12 months or longer. Furthermore, this finishing process may begin at various stages of maturity, and the resulting beef can differ widely in its quality factors.

These and other related physical characteristics of the cattle industry create statistical problems that are not common to most other agricultural products, even including some of our other livestock and livestock commodities.

Because of the wide variability and flexibility in the production process, it is extremely difficult to delineate an area of production that can be estimated and ultimately checked out against an independent count of "the crop." For this reason, measures of the accuracy of the original estimates are hard to apply. For example, we have no real measure of how many fed cattle are marketed over a given period of time. In fact, we can't even identify with certainty what proportion of the total cattle marketings qualify as fed cattle. Contrast this situation with a commodity like soy beans where records of crushings and exports can be identified by annual crops, thereby providing an independent count against which the estimated harvest can be "trued-up" after the marketing season is over.

As already indicated, a related aspect of our difficulties in the field of cattle statistics is the lack of precise definitions. Let me illustrate what I mean with a few examples.

Take calves—in normal market parlance this term can mean a few-week-old vealer of strictly dairy breeding, or a 600-lb. feeder steer, depending upon what part of the country one may be in. Or, in the case of our weekly and monthly slaughter figures, we know that the distinction between cattle and calves frequently depends on how the animals are handled in the packing plant; i.e., whether they are slaughtered on the cattle bed or on the calf rail. The result is that a significant number of animals show up in the marketing statistics as calves, even though they are counted as cattle in the slaughter reports. The reverse also can be true.

Another example is the term "fed cattle." We tend to visualize such

cattle as being well-bred beef steers contently eating themselves into Prime beef in feed lots throughout the Corn Belt and in other parts of the country. However, this is hardly an adequate definition to include the rather large number of cows, heifers and calves of varying beef characteristics fed to varying degrees of finish before marketing.

"Grass cattle" is another term that has a definite meaning to cattlemen and could be a very useful classification for supply-measuring purposes, if it could be accurately defined and applied at some point in the marketing process.

Even the final product *beef* is a conglomeration of many kinds of meat of widely varying characteristics. For instance, Prime grade ribs and loins destined for the night club and hotel trade differ as much from canner and cutter cow beef (which generally is not consumed as beef at all) as oranges do from cabbage. Yet, it is not uncommon for us to talk about beef production as though it were a single homogenous commodity.

I do not wish to belabor these points, but I think they must be fully recognized in the appraisal of our cattle statistics, and in any suggestions any of us may have for broadening or improving these data. It does little good, for instance, to say that we ought to have more specific information on the marketing of veal calves, as distinct from beef-type calves, unless at the same time we are prepared to offer a better definition of what is meant by this category and can suggest a satisfactory way for accurately collecting the data.

### *Some Specific Suggestion*

Now I should like to turn to some specific points for consideration by all who are interested in statistics of cattle supply. Let me say at this point that in the preparation for this paper I contacted a number of friends who are interested in the subject of cattle statistics, and I would like to thank them for the suggestions they have given me. My method of collecting this information probably would not stand careful scrutiny by experts in questionnaire construction and sample design. Nevertheless, the response to my letter was gratifying and contributed several significant points for inclusion in this paper.

(1) As we all know, the USDA depends heavily on the Census of Agriculture for quinquennial bench marks against which to true-up its estimates of January 1 numbers. For various reasons, including the vassilating enumeration date of the census, as well as problems of underenumeration, the livestock statisticians of the USDA have had to devise means of converting the census data to their January 1 equivalent numbers. Although considerable ingenuity has been shown in making these necessary manipulations, the fact remains that the annual cattle inven-

tories are being estimated without benefit of a really satisfactory enumeration of the cattle population by the Census Bureau. The discrepancies are especially noticeable in the individual state data, on both inventories and reported marketings. The lack of an accurate census enumeration for cattle creates a severe handicap for the Agricultural Estimates Division which unavoidably affects the quality of practically all the cattle estimates. Until a remedy to the problem can be developed, analysts will have to recognize that most of the cattle figures are not as precise as we would wish them to be. In a way, our tolerance of this situation may reflect confidence in the ability of the Agricultural Estimates Division to produce good cattle statistics regardless of this difficulty. On the other hand, it may also be that we really have not taken this problem as seriously as we should.

(2) The next point is one that has been mildly frustrating to all of us who use the balance-sheet approach to study the general trend in cattle numbers. The bothersome feature here is the fact that when total slaughter is used instead of marketings as the major disappearance factor, the annual balance sheet of cattle numbers just doesn't balance. To the extent that the several items in the balance sheet are independently estimated, considerable justification exists for the arithmetical discrepancies shown. In other words, the "unaccounted for disappearance" (which may be a negative as well as a positive figure) would be merely the composite errors of estimate. Accordingly, tinkering with the figures for the sake of eliminating or hiding these errors, would be unwarranted. This would be a good argument except for two things—(a) the unaccounted-for factor is of such magnitude as to greatly reduce the usability of the annual balance sheets, and (b) the USDA does publish 49 separate balance sheets (one for each state and a U. S. total) using estimated marketings as the major disappearance factor, which do balance. Without meaning to be unduly critical, I have a strong hunch that the absence of imbalance in these balance sheets is not due to a similar lack of errors in the estimates of the individual items.

(3) One of the gaps in the statistics on cattle slaughter that we wish could be plugged is the lack of sex classifications in the monthly non-federally inspected slaughter figures. Such additional information would be useful to the analyst in charting the development of the cattle situation during the year, especially in connection with the liquidation or holding back of breeding stock. But probably a more important use would be the help such information would give to the estimators themselves in truing-up the estimates of the various kinds of cattle in the January 1 inventory. I have reference here to the so-called progressive balance sheets in which we try to take advantage of the physical fact that the heifer calf on



January 1 is the "heifer 1-2 years old" the following year and is among the "cows 2 years+" of the year after. In the absence of a good count of total slaughter by sex classes this kind of analysis also falls short of its mark. This added detail would also help, of course, when it comes to analyzing prices, where better information on the kinds of beef in the total supply would be useful.

Along with this problem is the lack of current information on farm slaughter of cattle and calves. Even though this disappearance has been declining in recent years, it still is important enough that we have to do a considerable amount of guesswork in analyzing the disappearance of cattle and calves during the year.

(4) Another area in which the analysts are more than a little in the dark is the calf crop. We appreciate greatly the development of the July calf crop report, which now is available about nine months sooner than used to be the case. However, we still have difficulties in reconciling the calf crop with the January 1 inventory of calves, because we don't know in which month the calves were born, nor do we know the breakdown of the crop between calves of dairy and beef breeding. The January 1 inventory shows heifer calves being "saved for milk" but all other calves are lumped together in a single catch-all category. This leaves a great deal of guesswork to be done at this very first stage in the process of cattle production. This is especially true in the case of heifer calves of beef breeding which may either stay in the beef herd or be marketed as feeder calves.

(5) Probably the greatest blind spot in all of our cattle data is the general area of cattle feeding. Not only are we uncertain as to the actual number and kinds of cattle being fed, but there also is a serious deficiency in our yardstick of fed cattle marketed. Practically everyone I contacted commented on one or more phases of this situation.

Before going any further on this topic, however, it would be unfair not to mention the fact that the Agricultural Marketing Service is well aware of the weakness in these cattle statistics and has taken such steps as its budget will permit to correct the situation. For instance, the quarterly cattle-feeding report has been extended to 13 states, and the weekly record of steer sales by grade has been expanded to 7 major markets.

Despite these improvements, here is an example of the approximating—which is just a kind word for guesswork—in which the analyst has to engage:

Taking the figures for 1955, marketings of fed cattle from 13 states were estimated by the Agricultural Statistics Division at 8,965,000 head. Making a liberal allowance for the other 35 states, total fed cattle marketings—as nearly as they can be defined—probably amounted to

about 10 million head in that year. From the cattle-on-feed reports we also can squeeze out the approximation that about two-thirds of these cattle were steers, which would be 6.6 million head.

Federally inspected steer slaughter in 1955 amounted to 9.3 million head, and the total slaughter of steers out of a 26.6 million slaughter of all cattle may be assumed to have been somewhere in the neighborhood of 12 million head.

Thus, the total steer slaughter in 1955 was divided roughly 50-50 between steers that could be classified from the available data as "fed cattle" and cattle that were "not fed." Although this may be a fairly good estimate of the number of fed steers produced for the year as a whole, it does not give us an adequate measure of marketings by major categories for shorter periods of time, which, of course, is needed if forecasts of marketing and prices are to be really useful.

If we take monthly steer slaughter under federal inspection as a measure of marketings of fed cattle, we have a figure cluttered up with grass cattle and other kinds of cattle that do not fulfill the concept of "being fed." Furthermore, we can't be sure that total steer slaughter follows the same pattern month by month as the federally inspected.

If we use sales of beef steers at 7 markets as a measure of fed-cattle marketings, we still are using an inaccurate yardstick, mainly because of the incompleteness of this record. For instance, these sales in 1955 totaled 3.8 million head for all grades. Making a minor adjustment for the lower grades and the fact that some heifers are included in these sales data, it appears that only a little more than half of the estimated total marketings of fed steers would be accounted for by these sales records.

(6) Because of the numerous difficulties encountered in measuring cattle and beef supplies, piecemeal additions to existing data are not likely to yield the improvement we are seeking. Therefore, I think it is high time that we step back and take a long, hard look at the physical nature of the cattle industry and at the statistics we now have. From such a review it may be possible to pinpoint more clearly the specific statistics that would yield a maximum amount of information on what is happening in the production and marketing of cattle throughout the year and over longer periods of time.

By assessing the entire problem in this way we might discover series of data that are no longer useful. We also might avoid adding to existing series where the point of diminishing returns has been reached in the collection of such data. And finally, such a study might bring into focus the blind spots in our knowledge where perhaps some priority for data development would be warranted.

In making this proposal, I am not finding fault with the Agricultural Statistics Division for a lack of interest in the subject of cattle statistics. As I indicated earlier, several significant improvements already have been made in the livestock data, and this part of the 1957 AFEA program stems from a desire to make further improvements in this area.

My plea, if it might be called that, is directed primarily to my fellow analysts who are engaged in supply and price forecasting for cattle and beef. We have a responsibility, it seems to me, to examine all of the available cattle data and to assess their ability to yield the supply-measurement information we are seeking. Such a project, undertaken either individually or collectively in some manner, would be welcome I'm sure by the Agricultural Statistics Division.

While it is conceivable that such study would uncover the fact that the cost of obtaining the basic data necessary for precise supply and price forecasting would exceed budget resources of the USDA, it would at least sharpen up our own judgement in the use of existing data.

#### *Brief Comment on Prices*

Thus far I have been talking only about problems of supply measurement. My assignment also included cattle prices, and I would like to make these brief additional comments:

- (a) USDA reportings of the market prices for live cattle are pretty good, so far as I have been able to learn. As is well known, however, an increasing share of our total marketings is moving through channels not at terminal markets, especially the auction markets. Because of the availability of good market news coverage and flexible transportation, auction prices are not likely to deviate significantly from those at the central markets. Nevertheless, it would seem that the time has come when some systematic reporting of cattle prices at auction markets may be in order.
- (b) At the wholesale level analysts have available two sources of price data—the USDA market news reports and the private market services, principally *The National Provisioner*. Either or both seem adequate for measuring price trends over a period of time. However, anyone working with wholesale meat prices should recognize that the concept of a Chicago market with fixed transportation differentials between other points is not so clear-cut as it was 30 years ago. Today "the market" is in a sense the whole United States, and the relationship between prices can and does vary from regional patterns of earlier years.
- (c) At the retail level the beef price quotations provided by the BLS are very weak, except for relatively superficial uses. One could spend several hours on this subject alone. There are so many problems involved in collecting retail prices that it seems doubtful if much improvement can be made in these statistics. I earnestly suggest, therefore, that price analysts study carefully the idiosyncrasies of these prices before planning studies using them.

### *Summary and Conclusions*

In conclusion I would like to sum up my remarks in these three points:

- (a) Cattle and beef are not single commodities of a homogenous character. Rather, they are conglomerate products that often make totals (in the case of supply) and averages (in the case of prices) relatively meaningless.
- (b) The complex nature of cattle production prevents its being treated as a single annual crop that can be measured accurately. Rather, cattle marketing must be viewed as a continuous "flow" that swells and contracts with basic changes in production. It is difficult to devise yardsticks of supply in this situation.
- (c) Because of the complications involved in collecting cattle statistics, analysts have a responsibility to examine all of the available data and to assess their ability to yield precise supply-measurement information. A complete appraisal of this nature should prove useful in any program for expanding and improving cattle statistics.

### DISCUSSION: EVALUATION OF AVAILABLE DATA FOR ESTIMATING MARKET SUPPLIES AND PRICES OF CATTLE

SAMUEL J. GILBERT

*Agricultural Statistician for Iowa, USDA, and Iowa State Department of Agriculture*

People will continue indefinitely to collect, process and use data on cattle and most other agricultural items. We have sometimes been occupied with possibly some extraneous matters in our collection, processing and use of data, such as problems of complete enumeration versus sampling, one kind of sampling versus another, one kind of name for collectors and compilers of data versus another, one sort of researcher as compared with or related to another.

By passing over such questions, we are privileged here to talk primarily of cattle. A great many points of view confront us in the demands for data. Users come from all parts of the national economy such as producers, market operators, consumers, researchers and teachers. The uses of agricultural data, including cattle data, are divergent.

In the collection and processing of cattle data, problems of definition began to face us many years ago and these problems have multiplied and intensified as the marketing system has become more complex. Russell Ives has brought this key question of definition to a point of primary focus as it should be. The subjective matter of when is a calf a "dairy" calf and when is it a "beef" calf illustrates something of this problem. A calf of mixed breeding may end up either way. The owner of dairy cows may produce calves of a dairy-beef cross for vealers and, unless the point can

be pinned down, the calves may be reported as "dairy" calves. Various suggestions as to classification and definition of cattle items are made for the purpose of obtaining and supplying more adequate data on numbers, market grades, age groups and size groupings of all cattle, feeder cattle, fed cattle, and so on.

Of course, with a subject as complicated as cattle production, marketing and pricing, the producer of beef on the hoof has difficulty figuring just when he is going to put his grain-fed stuff or other cattle on the market. The market changes and he may change his mind. The latter change, or change of mind, may be inexplicable.

One cannot expect the complexities inherent in the subject of cattle data to disappear. It may be possible to reduce the number of problems and their size. To do this will require much additional thought, work and experimentation in handling these *available* data about which we are talking. Rounding out the subject to include the dropping of *old* data and the developing of *new* data is also being done and is most necessary. Employment of as much simplicity as possible is most important. That is, let us state our problems on data needs in the simplest possible language, complex as the need and use of the data may be. It is important to use simple and plain inquiries in trying to arrive at the most simple or least complicated statements describing the basic data. In dealing with cattle data, the complications of the industry will be confusing enough without more confusion being furnished through failure to observe the value of simple and practical approaches in the development of data.

Quantity and accuracy of cattle data "needed," and possibly requested, should bear direct relationship to the quantity and accuracy of the data as it is used or to be applied.

Data, generally speaking, will serve best if used for purposes to which adapted. It is difficult to get more out of data than is put in in the first place. Ultra refinement in the use of crude data has been likened to the gold plating of a crowbar in one reference here today. The point is well put. The speaker would like to add that a crowbar, whether all steel or gold plated, makes a poor toothpick.



## LIVESTOCK DATA PROBLEMS IN THE CENSUS OF AGRICULTURE<sup>1</sup>

RAY HURLEY

*Agriculture Division Bureau of the Census*

**L**IVESTOCK and livestock production represent a major part of U. S. agriculture. The sales of livestock and livestock products account for more than half of the value of all farm products sold. The inventory value of all livestock and poultry exceeds 10 billion dollars and is equivalent to about \$2,500 per farm. More than 90 percent of all farms have some livestock and poultry. However, livestock production is the most important farm enterprise on only about a third of a million farms and the concentration of livestock production on a smaller number of farms has been increasing during recent years. For example, 86,000 dairy farms now have more than one-fifth of all the milk cows and sell more than two-fifths of all dairy products. About 41,000 poultry farms have about one-fifth of all the chickens and sell about three-fifths of all the poultry products.

The 300,000 farms on which livestock and poultry production is the most important enterprise have over one-fifth of all the cattle, a third of all the hogs, one-half of the sheep and one-fourth of all the poultry in the United States. These 300,000 farms account for over one-fourth of all cattle sales, two-fifths of the hog sales, two-thirds of the sheep sales, and more than half the dollar sales of all livestock and livestock products.

These background data indicate the importance of livestock and livestock production in our agricultural economy. Reasonably accurate data on livestock and livestock production are of significant economic importance to several hundred thousand farmers. They are essential to minimize blindman's bluff in the market place.

Since its beginning in 1840, the Census of Agriculture has been concerned with the collection and publication of data regarding livestock and livestock production. Generally, the amount of data collected regarding livestock and poultry increased from census to census, although the number of inquiries in recent censuses has been limited in order to improve quality of the data and to provide for the collection of other information.

In analyzing the census experience covering 16 nationwide censuses and almost 120 years, one concludes that the nationwide collection of satisfactory livestock data for 4 to 6 million farms is a difficult task and involves a number of problems. Even the job of obtaining a count of livestock is fraught with difficulties. Livestock numbers change every day of the year. Marketing is a continuous process. Livestock inventories are

<sup>1</sup> The views expressed herein are not necessarily those of the Bureau of the Census.

affected by births, deaths, farm slaughter, and by growth and change in age of animals.

For some kinds and classes of livestock disappearance during the year is highly seasonal, as in the case of hogs. Livestock are moved from one area to another for feeding or pasture purposes and a substantial number of animals are involved. While these movements do not affect United States totals they do create problems of getting accurate counts in local areas. The relative importance of marketings and of changes in numbers vary not only with the kind and class of livestock but from area to area. For example, there are heavy marketings in the Corn Belt of cattle on feed during the first half of the year. On the other hand cattle from large-scale range-type operations are marketed largely in the fall. There is a continuous movement of cattle culled from dairy herds and from small herds for local market and slaughter. The age composition of livestock changes throughout the year. The age make-up of a cattle inventory is significantly different on June 1 than on January 1.

Because of seasonal changes in livestock numbers, it is desirable that inventories of livestock be made at approximately the same time each year. The use of a uniform census inventory date has not been possible largely because of changes in the date of the taking of the Census of Population. Of the 16 censuses of agriculture, the specified inventory date was June 1 for 7 censuses, January 1 for 4 censuses, April 1 for 3 censuses, April 15 for 1 census and October-November for 1 census. The change in dates for livestock inventories makes it difficult to compare counts at various censuses, even though the procedure of enumerating separate age groups was resorted to in several censuses for the purpose of improving comparability. Legislation has been approved to permit the taking of future censuses of agriculture starting in October. Thus, we hope that a considerable part of the difficulties of comparability from year to year of livestock inventories will be eliminated by the use of the same base period as for the 1954 Census.

As livestock numbers on individual farms and even on all farms change from day to day, the selection of a date for making an inventory of livestock can affect the resulting number. For censuses prior to 1954, census inquiries and instructions were to report the number of animals as of the census date, i.e., January 1, April 1, etc. However, field check by technical personnel after some pretests for the 1950 Census of Agriculture indicated that farmers, part of the time, gave a count of livestock at the date of the visit of the enumerator rather than as of the specified census date. Because of our experience we asked in 1954 and will probably ask in future censuses, the inventory count at the time the agriculture questionnaire is filled out for the farm. In order to provide a basis for the

interpretation of the data, we have and will provide data on the percentage of questionnaires filled out each week during the enumeration period. Usually 4 to 5 percent of the agriculture questionnaires are filled out each day of the census enumeration period. Thus, the average date of enumeration usually falls in the third week after the start of a census.

The census has always had problems regarding the complete coverage of farms, ranches, and places with livestock. For example, prior to 1870, no attempt was made to enumerate livestock on ranges in the West. In 1880, a special questionnaire was used in the range states and in 1890 special agents were employed to make an enumeration of livestock on ranges. In the range states, the presence of relatively large migratory livestock units, particularly of sheep has made complete enumeration difficult. Sometimes, these range units were not associated with ranch properties, as they operated on permit, leased and unimproved lands. For some censuses lists of large units were used to help insure or check the completeness of the enumeration. Since 1940, the completion of lists of "large farms" in advance of the census and the use of checking and other procedures to see that all such places were included in the census have insured the almost complete enumeration of such places. A check of census records for wool against records of the Commodity Stabilization Service on wool payments for 1954 Census of Agriculture for Wyoming indicates that the 1954 Census missed not more than one-half of one percent of the producers having 5,000 pounds or more and the amount of wool produced by these producers is equivalent to less than one and one-half percent of the total of the state.

It is difficult to obtain a complete enumeration of farms and ranches in the United States. The difficulties are related to the number of large farms to be enumerated, the variety of arrangements under which farms are operated, the employment of a large number of temporary personnel to take and supervise the taking of a nationwide census, the reluctance or inability of some farm operators to provide accurate information, the locating of farms, the unavailability of information locally for some agricultural operations, the absence of farm operators from their homes, the failure of some census enumerators to do a thorough job and the opinion of some operators of marginal farms that their operations are not important enough to be included in a census.

In general, satisfactory objective data to indicate the completeness of censuses of agriculture were not available prior to 1950. In connection with the 1950 and 1954 censuses of agriculture, the Bureau of the Census undertook special surveys involving reenumeration of farms, to provide objective data on the coverage of the census. In regard to livestock, the reenumeration for 1950 was made several months after the census and because of changes in livestock numbers through time, does not provide

a satisfactory basis for measuring the completeness of the enumeration of livestock. The special survey for the 1954 Census of Agriculture was completed largely within 3 months after the census and provides some approximation of the livestock on farms not enumerated by the census. Our records of livestock on farms missed by the census refer to a period about 3 months after the census. On the basis of these records, the percentage of the total livestock on missed farms was for cattle, 3.9; for hogs, 1.2; and for chickens, 2.3.

In order to evaluate the accuracy of the 1954 livestock census, the Bureau of the Census contracted with the Statistical Laboratory of Iowa State College to make a special sample survey regarding cattle and hogs in Iowa and Northern Illinois. The area covered by the survey contains about 8 percent of the cattle, 32 percent of the hogs, and 21 percent of sows farrowing and accounts for about 10 percent of the cattle and over a third of all hogs sold in the United States.

The stratified sample for this survey and the farms to be included in this special survey were selected by Iowa State College completely independent of the Bureau of the Census. The sample contained over 500 farm units. The sampling rate varied, generally, according to the number of animal units expected to be marketed. The sample contained approximately one-eighth as many farms expecting to market less than 50 animal units and one-fourth as many farms expecting to market 50 to 124 animal units as farms expecting to market 125 or more animal units. For farms included in the sample a trained interviewer visited each farm in the first two weeks of April, July, and October 1954 and of January 1955. At each visit, information was obtained on the inventory number of cattle and hogs on the farm for the opening date of the quarter and the number of animals purchased, sold, born, died and butchered within the preceding quarter. During the last quarter of 1954 additional information was obtained to establish the exact date for the sales, births, and deaths of hogs and cattle. The number of sows farrowing was obtained by months for each quarter.

Census questionnaires for the farms in this sample were matched against the records obtained by Iowa State College. For 93 percent of the farms in the sample, the Iowa State College reports were considered as covering the same livestock as the Census, for 6 percent of the farms there were some doubts as to whether the Iowa State College and Census reports covered the same livestock, and for 1.7 percent of the farms, no census report could be found. The matching of the Census and Iowa State College reports indicate that the census had 4 percent fewer cattle on hand, 1 percent fewer hogs on hand, and 0.3 percent more sows farrowing than the Iowa State College reports. Cattle on farms that could not be identified in the census, accounted for one-half the difference between reports of Iowa State College and the Census. In the case of hogs on hand



and sows farrowing, the numbers on missed farms, more than covered the excess numbers reported for the census on matched farms. The number of hogs on farms not identified in the census represented 1.7 percent of the total number of hogs on all farms and the number of sows farrowing on farms not identified in the census, amounted to 1 percent of the total for all farms. The difference in livestock on matched farms, for which there was a doubt regarding whether the Census and Iowa State College reports covered the same livestock, accounted for 10 percent of the gross difference in the case of hogs on hand, and for about a third of the gross differences in the number of sows farrowing.

The Census attempts to take an inventory of livestock on a defacto basis. Livestock are to be counted on the farms or ranch on which located at the time of the enumeration. To insure that all animals, regardless of ownership are included, instructions on the 1954 Census questionnaire contained the following instructions: "Include animals on this place owned by you and by others. Also include any animals belonging to this place but grazing on National forests, grazing districts, or open range."

The multiple ownership of livestock on farms results in reporting errors, because farm operators sometimes report on a personal rather than a farm basis. Moreover, some persons will report for themselves operations that belong to a tenant or part owner. In the Iowa State College analysis, 7 percent of the farms involved multiple ownership and more than 10 percent of the livestock were on such farms.

A recent survey indicates that there are outside of the multiple unit operation in the South, at least 180,000 landlords who own part of the livestock on tenant and part owner farms. About a fifth of these landlords are also farm operators, a fifth are retired farmers and a fifth are housewives. Almost two-fifths of them live on farms. The Census as well as every survey has a real problem in getting livestock reported on a defacto basis for these farms.

The Agricultural Marketing Service regularly issues annual estimates of the number of livestock on farms. These estimates are based, in part, on Census benchmarks. However, these estimates relate to January 1 date and hence for many kinds of livestock are not directly comparable with Census totals. Only in the case of horses and mules and sows farrowing are these totals reasonably comparable with the Census. For horses and mules, the Agricultural Marketing Service estimate for January 1, 1955 exceeds the Census total by 4.1 percent. By states, the Census total and Agricultural Marketing Service estimates do not differ in 8 states and differs by less than 2 percent in 6 states, 2 to 4 percent in 18 states, 5 to 9 percent in 13 states, and over 10 percent in 3 states (two of these states have a small number of horses and mules). In the case of

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sows farrowing in 1954, the Census totals and Agricultural Marketing Service estimates are directly comparable. At the United States level, the Agricultural Marketing Service revised estimate exceeds the census by 17.0 percent. In 1 state the difference between the Census and Agricultural Marketing Service revision is less than 2 percent, in 7 states the difference is 5 to 9 percent, and in 40 states the difference is 10 percent or more. In Iowa and Illinois, the difference is 10.0 and 17.5 percent, respectively. In the East and West North Central states where approximately 79.7 percent of all sows farrow, the difference was 13.5 percent.

Even after adjustments are made for difference in inventory dates, the Census and Agricultural Marketing Service estimates are not in exact agreement. The explanation of the differences between Census totals and Agricultural Marketing Service estimates and the measuring of these differences are important problems. However, Census totals appear to have an influence, significantly in some states, on Agricultural Marketing Service revisions of their original estimates. The following data summarizes the revision of Agricultural Marketing Service estimates for 1955 after the totals for the 1954 Census became available.

Item	Average revision in original AMS estimate percent	Number of states with a revision from the original estimate to the final AMS estimate of the percentage indicated				
		None	.1 to 1.9 percent	2.0 to 4.9 percent	5.0 to 9.9 percent	10 percent and over
Horses and mules.....	5.6	10	4	10	13	11
Cattle and calves.....	1.2	11	14	12	6	5
Cows 2 years old and over kept for milk.....	4.0	8	7	13	12	8
Hogs and pigs.....	9.0	6	—	7	12	23
Sows and gilts farrowing:						
Spring.....	5.4	10	—	7	10	21
Fall.....	8.2	13	—	5	11	19
Sheep and lambs.....	2.1	8	8	11	5	16
Chickens.....	14.5	1	4	6	4	33

The collection of information on livestock production in current censuses presents a number of problems. The reporting of production involves a considerable memory recall of numerous sales and in the case of a fall census, a forecast of sales to be made. While the increase in record keeping by farmers and the increasing concentration of livestock production on the larger, specialized commercial farms will result in significant improvements in census endeavors in this field, the results may not be fully satisfactory.

Industry and other agencies have been quite critical of census data on wool production. For 1954, the Census totals are below U. S. Department of Agriculture revised estimates 10 percent for both sheep shorn

and for shorn wool produced. Census production is low compared with that indicated by reports from manufacturers, warehouses, etc. How much of the difference is the result of the conversion of "washed" wool to grease wool basis, of duplication of reporting and the incompleteness in the census is not known. For the Census of Agriculture the only checking has been the comparison for 1954 reported earlier for Wyoming. It has been suggested that the underreporting of the wool production is the result of some farms having sheep, not reporting wool. An analysis of the number of sheep on such farms indicates that this explanation could account for only a small part of the existing differences.

In the case of the cattle and hogs sold, our best data regarding the accuracy of census data were obtained from the analysis made by Iowa State College. This analysis indicated that the number of cattle sold as shown by the Census was 13.9 percent less than the number shown by the Iowa State College survey. About one-sixth of this difference was accounted for by farms not identified in the census and about one-third by the matched farms for which there was doubt regarding the Census and Iowa State College reports relating to the same livestock. In the case of hogs sold, the Census total was 14.3 percent less than shown by the reports of Iowa State College. About 7 percent of this difference is accounted for by farms not identified in the census and 8 percent is accounted for by farms for which there was a doubt regarding the Census and Iowa State College reports relating to the same livestock.

This discussion has indicated in part the nature and the magnitude of the census livestock data problems. Within our resources and abilities we are working to solve these problems. We hope objective appraisal of our efforts will result in greater understanding, acceptance and use of census livestock data. However, the increasing complexity in the contractual arrangements and conditions relating to livestock and livestock production creates new problems and increases old problems. Truly, we must run in order to keep ahead. We hope criticism by others, self criticism and analysis of the accuracy of the census plus improved methods will result in more accurate census livestock data.

#### DISCUSSION: LIVESTOCK DATA PROBLEMS IN THE CENSUS OF AGRICULTURE

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In starting the discussion of Mr. Hurley's paper, I would like to mention two important uses of census livestock data:

- (1) The census provides detailed data on various livestock items by small geographic areas, and by numerous other classifications such as size of farm, type of farm, income class, etc. Various cross-classifications of these data are possible, and the census provides measurements of certain types of items for which only periodic information is necessary.
- (2) The census provides benchmark data needed to establish the level for many currently published statistical series and, in addition, provides a mass of data that are widely used in designing samples, and in expanding current sample data to estimates.

Hurley mentioned that the census of 1954 was the first census taken in the fall of the year. We join him in urging that each agricultural census be taken at the same time of year. The seasonal nature of livestock operations points up the need for a consistent date in order to compare data from one census to the next. In our opinion, the gains from a standardized date offset the disadvantages that any given date has for certain species.

January 1 livestock inventory estimates are available by states from January 1867 to date. To maintain the continuity of these data and to provide a basis for calendar year balance sheet estimates, it is necessary to adjust the census inventory data to a January 1 base. This was done in 1954 by drawing a sample of about 160,000 farms from the census. The sample farms were mailed an inquiry about January 1, 1955.

The data from this survey were matched farm by farm with the data reported to the census, and the reported changes were used to measure the change in livestock numbers from the date of enumeration to January 1. In general, this procedure worked very satisfactorily. On a national basis, the changes from the average enumeration date as shown by the sample were within 1 percent of the change computed using slaughter statistics adjusted to allow for births and deaths during the period.

Hurley mentioned the revisions in livestock estimates that were made after census data became available. In arriving at the revised estimates, census data were reviewed county by county with data from annual State farm censuses, with livestock assessment records, and with any other check data available. Allowances were made, where necessary, for underenumeration. Adjustments were also made to provide a reasonable balance among the various series which included census benchmark data, records of livestock movement, livestock slaughter, births, and death losses.

In this connection, Hurley mentioned the wool production check in Wyoming. I would like to point out that this was a check of wool produced in 1954 with wool sold between April 1, 1955 and March 31, 1956,

most of which was clipped in 1955. The number of stock sheep declined about 5 percent in Wyoming during 1954, and by the time of the census enumeration most producers were down to their 1955 level of operations. The check was helpful, but in my opinion it neither proved nor disproved the accuracy of the 1954 census enumeration.

A quality check of the livestock census requires checking two important points: (a) operations that are missed entirely, and (b) omissions or reporting errors for the operations that are included. To assure complete coverage of all operating units requires trained people who are working hard to do a good job. The regular census personnel meet these requirements and they are striving to set up operating procedures that will assure complete coverage. Reporter and enumerator errors are another problem and a more difficult one to check. The census schedule is necessarily long and involved. The farmer and enumerator are not as accurate and careful near the end of the schedule as at the beginning. Thus, much can be done to reduce these errors by limiting the schedule to items that can be answered quickly and accurately, and by reducing the number of items for which information is requested. The schedule should not include items that can be estimated satisfactorily by some less expensive means, unless, of course, local area details are urgently needed.

To illustrate, should we ask every hog producer in the United States to report the number of hogs sold during the year and their value? Particularly when, as in the case of the 1954 census, the producer had to estimate both sales and value for the one to three months that remained in the year at the time the interviewer called at his farm. Would it not be better to restrict the questions to items such as the number of hogs on his farm now, the number of sows that farrowed last month, and similar known items, and estimate gross sales on the basis of the relationship between these items and total sales as shown by data from a sample of farmers? If the farmer can make only an approximate answer to a question, then special surveys from a sample of farms, if properly handled, will yield just as good results.

Our present-day agricultural interests are data conscious. A veritable flood of requests are received for data that are not available. Prominent spokesmen for the cattle industry believe that cattle on feed reports should be made monthly instead of quarterly. Requests are received to put pig crop reports on a monthly basis. Poultry interests want the weekly hatchery report, which now relates to broiler chicks and poults, expanded to take in hatchings of egg-type chicks. More frequent, more up-to-date statistics are needed to help in operations from day to day and week to week. In addition, data are needed by smaller and smaller areas and by detailed cross classifications. For many uses, state estimates

are not adequate; data are needed for counties or other within state areas.

Those of us that turn to the census or elsewhere for additional data need to decide that there is an urgent need for the series. We need to make sure that the series justifies the burden it places on the reporter, and that it justifies the cost of collection, analysis, and publication. We need to help decide the best way to get the series, is a complete census necessary or will a sample suffice? New information has to be supplied by someone—the farmer, the marketing agency, the handler, the financing agency, the packer, or perhaps even the retail store. In our modern economy, each of these sources of basic information is already burdened with a terrific accounting and record keeping load. We need to keep the burden we place on these people down to the minimum consistent with a good statistical program.



## MODERN FARM MANAGEMENT

Chairman: Lee Langsford, Agricultural Research Service, USDA

### PROBLEMS OF UNCERTAINTY IN FARM PLANNING\*

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**A**S PEOPLE have been saying for a very long time, we need a generally acceptable, comprehensive theory of economic behavior under uncertainty. I suspect that we shall not have one very soon and that, to make much progress at all, we shall have to consider a great deal more than economic behavior in our models.

Meanwhile we have a variety of scattered suggestions and a few well-coordinated but not entirely satisfactory theories which relate to special aspects or kinds of uncertainty, or to particular ways of viewing uncertainty. These give fragmentary insights but leave many perplexing problems.

Two kinds of contributions can be made in this situation. Theories can continually be reformulated and extended and such ideas as are available at any time can be applied to empirical problems. Most such applications are necessarily crude and the results are themselves uncertain. Our willingness to use the practical implications depends at least as much on judgment as on the manner in which the implications were derived.

Nevertheless, crude attempts at application may serve several useful purposes and are probably necessary to the continued improvement of our thinking in this area. Crude applications can still be carefully conducted and can contribute tests of some assumptions underlying our theories, hints for possible future developments, and some new insights into practical problems.

Before mentioning a few kinds of theories and making a few remarks about possible applications, I should like to propose a simple outline of decision problems that I believe is broad enough to cover many instances—empirical and theoretical, certain and uncertain. It may sometimes seem awkward because some aspects may be trivial in some contexts. However, I believe the attempt to allow in one framework for a variety of circumstances has offsetting advantages.

Parts of a decision problem are sets of possible events, actions, strategies, and consequences; a criterion for ordering the consequences; and a function assigning a consequence to each pair consisting of an action and an event.<sup>1</sup>

\* Journal Paper No. 2129 of the Michigan Agricultural Experiment Station.

<sup>1</sup> This framework, a minor re-formulation of others in the literature, is intended to cover the topics to be introduced into the present discussion without introducing unnecessary complications. The principal lack of generality of which I am aware is that there is no provision

An event,  $z$ , of the set of possible events,  $Z$ , (written  $z \in Z$ ) is a circumstance or combination of circumstances relevant to the decision-maker's welfare and behavior but outside his control. The occurrence of a certain set of prices, credit availability or non-availability and weather phenomena are examples of events that might be relevant in applications to farm planning.

An action might be selection of a certain input combination, signing an SCS contract or selling 1,000 bushels of corn from storage. An action or combination of actions will be denoted by  $x$  and the set of which it is an element by  $X_z$ . The  $z$  subscript recognizes that the set of possible actions depends on which events occur. Building a silo may not be possible unless available credit materializes, 5,000 bushels of corn cannot be harvested unless suitable weather is experienced, etc.

A consequence (or combination) is a meaningful result of actions and events. Net revenue realized from a choice of inputs and the actual weather and prices, good seed-beds resulting from careful cultivation, and pride of ownership resulting from recently expanded acreage are examples. A consequence is denoted by  $y$  and we write—

$$(1) \quad y = \eta(x, z)$$

to indicate its functional dependence.

It is convenient to use a term like event (or its symbol  $z$ ) in some contexts for a simple phenomenon like one of those cited above and in others for fairly involved combinations of simpler events. In a dynamic theory, for example, we might want an event to be understood as a sequence of price vectors, weather experiences, regulations, and other factors. In other words, a complete history of the relevant circumstances in the decision-maker's environment is called an event. Similar considerations apply to acts and consequences.<sup>2</sup>

A strategy,  $\sigma$ , is a function that designates an action corresponding to any selected event. We write—

$$(2) \quad x = \sigma(z).$$

Thus a strategy is a way of reacting to events in one's environment. For theories of behavior under uncertainty it is important to note that, whereas the set of possible actions depends on which event obtains, the set of possible strategies is independent of events. Thus a strategy can be selected without knowledge of the event.  $\Sigma$  will designate the set of possible strategies.

In a certainty theory ( $z$  is known,  $Z$  contains one element) the distinction

for actions to influence events. This means that anything the decision-maker influences must be treated as an action or a consequence. In some contexts this would be a serious inconvenience; I believe it is relatively minor here.

<sup>2</sup> See Savage [14], Ch. 2. He uses the term decision for what we are calling a strategy.

between action and strategy vanishes. This is also true of static theories involving uncertainty since the action has to be completely specified before unknown aspects of the environment can be observed.

It is assumed that there is some natural way to order consequences<sup>3</sup>—i.e. to be able to say of any pair  $(y, y^*)$  that  $y$  is better than (preferred to)  $y^*$  or that  $y^*$  is better than  $y$  or that they are equally good (indifferent). The decision problem is to order the strategies (or select an optimal strategy) in a fashion that reasonably reflects the given ordering of consequences.

In certainty problems there is no difficulty about this. Each strategy (or each action) is associated with a known consequence and one strategy is better if its consequence is better. Thus certainty problems are trivial as far as the central issue of decision theory is concerned. There may be some interest in the function relating strategies or actions to consequences and, especially in dynamic theories, in how the consequences are ordered (see e.g. Hurwicz [9], Lorie and Savage [11], Hildreth [7]).

Frequently consequences are ordered by a real valued function, the value taken by the function being interpreted as something like net revenue, negative cost, utility, or expected utility. Such a function will be called a criterion and is assumed to exist in the cases to be discussed.

To illustrate some of these remarks, consider the static theory of the firm. Let  $z$  stand for known prices,  $X$  for the set of possible input-output combinations permitted by the production function, and  $y$  for net revenue.  $x$  is the input-output combination chosen and the criterion is an identity.<sup>4</sup>

Alternatively, one could (for the case of a single output) regard  $z$  as a particular production function,  $x$  as a chosen input combination ( $X$  would be the set of all non-negative input combinations),  $y$  would be the resulting input-output combination and the criterion would be given by the equation for net revenue. This illustrates the fact that many situations can be interpreted within the suggested framework in more than one way.

Of course, in a situation involving uncertainty, it is desirable to include uncertain elements among the environmental factors. It is often convenient when dealing with uncertainty to simplify the problem by eliminating some of the elements. If  $\phi$  denotes the criterion and  $u$  is a value of the criterion, we have—

$$(3) \quad u = \phi(y)$$

and using (1),

$$(4) \quad u = \phi[\eta(x, z)] = \psi(x, z).$$

<sup>3</sup> This ordering may be partial—e.g. in most formulations of welfare economics.

<sup>4</sup> A more complete interpretation would be to say that the criterion is a utility function and that, since utility is assumed to increase strictly monotonically with net revenue, actions can be ordered by either.

The derived criterion  $\psi$  may be applied directly to pairs of actions and events thereby dispensing with the need to refer to consequences at all once  $\psi$  is accepted.<sup>5</sup>

The theories of decision under uncertainty to which I shall refer may be put into two classes—probabilistic and game theoretic. The former postulate that the decision maker acts as though<sup>6</sup> he has a subjective probability distribution defined over the set of possible events. Any strategy he selects will then determine a probability distribution of consequences. The strategy which maximizes expected utility (in some applications expected net revenue is maximized or expected cost is minimized) is optimal.

Game theoretic models are characterized by the supposition that certain events can be recognized as possible but cannot meaningfully be described further with probability concepts—i.e. probabilities and probability distributions cannot usefully be applied to these events. In such models, choice of a strategy by the decision maker is associated with a set of possible consequences (corresponding to the set of possible events) and to evaluate possible strategies he must establish preferences among sets of possible consequences.

A review of both kinds of theories and an extensive bibliography may be found in Savage [14] along with a careful development of a personalistic view of probability that justifies probabilistic models for those who find the view acceptable.<sup>7</sup>

<sup>5</sup> Actions could also be eliminated, since

$$(4) \quad u = \psi(x, z) \text{ and}$$

$$(2) \quad x = \sigma(z),$$

$u$  is determined if  $z$  and  $\sigma$  are known, i.e.

$$(i) \quad u = \theta(\sigma, z).$$

Except for the tacit special assumption noted in footnote 1 which creates an asymmetry between the decision maker and his environment, this gives the simplified form of a zero-sum two-person game described by Von Neumann and Morgenstern [20]. The general form of the zero-sum, two-person game could be obtained by defining the "environmental strategy," say  $\zeta$ , which determines the "environmental action,"  $z$ , corresponding to any action,  $x$ , of the decisions maker, i.e.—

$$(ii) \quad z = \zeta(x).$$

If (2) and (ii) are of appropriate form (the circumstances of a game usually assure this) they may be combined with (4) to give

$$(iii) \quad u = \lambda(\sigma, \zeta)$$

which would be the payoff function of a zero-sum, two-person game.

<sup>6</sup> All theories involve substantial idealizations of reality. No one would suggest that people consciously assign probabilities to large numbers of events. It is shown that decision making that exhibits certain consistency properties coincides with decision making directed towards maximization of expected utility.

<sup>7</sup> An earlier account of economists' approaches to decision under certainty before game theory was a major influence is given by Arrow [1].

All recent developments in this area owe much to Von Neumann's and Morgenstern's theory of games [21] and even firm believers in personal probability recognize situations in which game theoretic models may be usefully applied. In what follows I should like to mention some applications of each type of theory to economic problems and to make a few suggestions regarding additional empirical applications, particularly to farm planning.

If one tries to superficially transfer the Von Neumann-Morgenstern results for the zero-sum, two-person game to entrepreneurial planning, the empirical implications are usually not acceptable. The entrepreneur would be pictured as trying to maximize his minimum net revenue (or some appropriate generalization of the concept). To do this, he would associate each strategy with the worst possible consequences under this strategy. In farm planning this would mean acting as though the worst possible combinations of low product prices, high input prices, adverse weather, etc. would be realized. The only solution would be to get out of farming and, although this might be accurate in many cases, continued application of the theory in this fashion would leave the farmer nowhere to go.

A somewhat more sophisticated application of the principle would be to consider the maximization of minimum net returns (or utility) over a set of possible probability distributions of events. Although this approach could be made to yield sensible results, it does not appeal to me because it seems even more artificial than other notions and it involves a priori information that would be particularly hard to formulate and test. I feel obliged to mention this prospect because others might be more attracted to it, but would prefer to discuss other approaches.

Direct applications of game theory have been made to problems of duopoly, but most duopoly situations are not zero-sum. There seems to be general agreement with the Von Neumann-Morgenstern analysis of a zero-sum, two-person game but economic situations to which it directly applies appear to be infrequent. More complex game formulations have been developed for particular oligopolistic situations (see Shubik [16], Mayberry, Nash and Shubik [12]).

Wald [22] developed an approach to statistics called the theory of statistical decision functions that is closely related to the theory of games and has led to many useful statistical procedures. It involves defining an appropriate concept of loss and choosing a strategy that minimizes the maximum loss. Savage [14], Ch. 9-13, suggests that the spirit of Wald's theory might usefully be applied to other decision problems by appropriately defining loss. Loss depends upon the strategy chosen and the event which occurs. It is the difference between the utility of the realized consequence of this strategy and event and the utility (or other measure) that could have been realized if the event could have been correctly forecast.

It is as though the decision maker took an omniscient counterpart, having



the same tastes and subject to the same technical constraints, as a standard and tried to act so as to be sure of not faring too much worse than the standard. The appeal of this principle depends a great deal on how small the maximum loss can be made. If it is sufficiently small, then no principle can do much better and there is little or no incentive to investigate alternatives.

It is easy to construct examples where the minimax loss is large and the desirability of this solution dubious. Chernoff [2] has noted possible logical objections to the principle and Savage takes the position that it is not a generally satisfactory principle for meeting uncertainty but deserves consideration when there is reason to believe that the minimax loss is small and in some group decision problems.

Using the notation introduced earlier and letting  $\tilde{x}_z$  be the optimal action for a given (unknown) event  $z$ , we have—

$$(5) \quad \max_{x \in X_z} \psi(x, z) = \psi(\tilde{x}_z, z).$$

If strategy  $\sigma$  is employed and  $z$  occurs, the loss is given by—

$$(6) \quad w = \omega(\sigma, z) = \psi(\tilde{x}_z, z) - \psi(\sigma(z), z).$$

Let  $\hat{z}_\sigma$  be given by

$$(7) \quad \max_{z \in Z} \omega(\sigma, z) = \omega(\sigma, \hat{z}_\sigma).$$

The minimax strategy  $\hat{\sigma}$  minimizes  $\omega(\sigma, \hat{z}_\sigma)$ , i.e.

$$(8) \quad \min_{\sigma \in \Sigma} \omega(\sigma, \hat{z}_\sigma) = \omega(\hat{\sigma}, \hat{z}_{\hat{\sigma}}).$$

An application of this principle to a problem of inventory control was presented by Dvoretzky, Kiefer, and Wolfowitz [3]. I believe it would be interesting to see how it could be applied to other economic situations. Are there important classes of economic problems for which the minimax loss is small? For statistics, the answer is "yes."

If, for example, we could tell a farmer that, for wide fluctuations in weather and prices, a certain production plan would return within \$500 of the maximum net revenue he could achieve with perfect forecasts of weather and prices, he would probably be curious about the plan. If we had to say \$3,000 instead of \$500, he might not be interested at all. It would be good to know which figure is nearer the relevant one for various farm situations.

To illustrate this principle a little more specifically, consider a simple one-period production problem with a single output,  $r$ , and a single variable input or index of variable inputs,  $x$ . Let  $p$ , the price of output be known to lie between a lower limit  $p_*$  and an upper limit  $p^*$ . Let  $q$ , the price of input, be known at the time input is decided and let

$$(9) \quad r = x^\beta \quad 0 < \beta < 1$$

be the (certain) production function.  $y$ , the net revenue, is given by

$$(10) \quad y = pr - qx = px^\beta - qx.$$

Equating the derivative to zero—

$$(11) \quad \frac{dy}{dx} = \beta px^{\beta-1} - q = 0 \text{ and}$$

$$(12) \quad \tilde{x} = \left( \frac{\beta p}{q} \right)^{1/(1-\beta)}$$

(12) gives the optimal input,  $\tilde{x}$ , for any known price. This is the firm's derived demand function for  $x$ . Using (10) and (12), optimal net revenue,  $\tilde{y}$ , is given by—

$$(13) \quad \tilde{y} = (\beta^{\alpha\beta} - \beta^\alpha) q^{-\alpha\beta} p^\alpha \text{ where,}$$

for convenience,  $\alpha = 1/(1-\beta)$ . The loss corresponding to a pair  $(p, x)$  is given by the difference between optimal net revenue given by (13) and net revenue for  $x$  given by (10):

$$(14) \quad w = \omega(p, x) = (\beta^{\alpha\beta} - \beta^\alpha) q^{-\alpha\beta} p^\alpha - px^\beta + qx.$$

Note that

$$(15) \quad \frac{dw}{dp} = \alpha(\beta^{\alpha\beta} - \beta^\alpha) q^{-\alpha\beta} p^{\alpha-1} - x^\beta; \text{ and if}$$

$$(16) \quad p = \beta^{-1} q x^{1-\beta}$$

then  $w=0$ ,  $dw/dp=0$ . For smaller  $p$ ,  $w$  is decreasing; for larger  $p$ ,  $w$  is increasing. For given  $x$ , say  $x=x_0$ , the loss function looks something like the curve in Figure 1.

Inspection of the curve reveals the following—

If  $p_*=p_2$  and  $p^*=p_3$ , then  $\hat{p}=p^*$  where  $\hat{p}$  denotes the admissible (between  $p_*$  and  $p^*$ ) value that maximizes the loss.

If  $p_*=p_1$  and  $p^*=p_3$ , then  $\hat{p}=p^*$ .

If  $p_*=p_1$  and  $p^*=p_2$ , then  $\hat{p}=p_*$  or  $p^*$ .

Now consider a curve  $\omega(p, x_1)$  where  $x_1 < x_0$  but is sufficiently close that  $\beta^{-1} q x_1^{1-\beta}$  is close to  $\beta^{-1} q x_0^{1-\beta}$ . To the left of  $\beta^{-1} q x_1^{1-\beta}$ ,  $\omega(p, x_1) < \omega(p, x_0)$  and to the right of  $\beta^{-1} q x_0^{1-\beta}$ ,  $\omega(p, x_1) > \omega(p, x_0)$ . Another way of saying this is that  $x_1$  is better than  $x_0$  for low prices and worse for high prices. If  $p_*=p_1$   $p^*=p_2$ , then  $\hat{p}=p^*$  for  $x=x_1$  and  $\omega(p^*, x_1) > \omega(p^*, x_0)$ .

A similar argument for  $x_2$  slightly greater than  $x_0$  would show that  $\hat{p}=p_*$  for  $x=x_2$  and  $\omega(p_*, x_2) > \omega(p_*, x_0)$ .

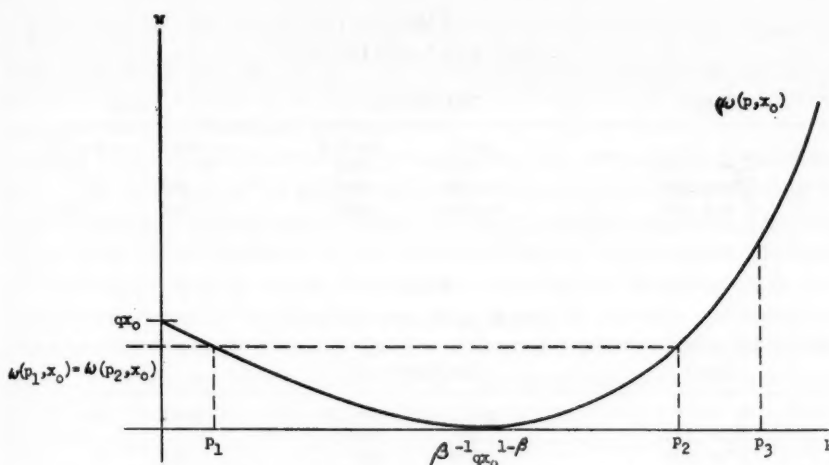


FIGURE 1

It appears, and could be shown with complete rigor, that there is a critical value of  $x$ , say  $\hat{x}$ , such that  $\hat{p} = p^*$  for any  $x < \hat{x}$  and  $\hat{p} = p_*$  for any  $x > \hat{x}$ .  $\hat{x}$  is characterized by the fact that—

$$(17) \quad \omega(p_*, \hat{x}) = \omega(p^*, \hat{x}).$$

Furthermore, to increase or decrease  $\hat{x}$  increases the maximum  $w$  and  $\hat{x}$  is therefore the minimax input. To solve for  $\hat{x}$  as a function of known quantities we set—

$$(18) \quad (\beta^{\alpha\beta} - \beta^{\alpha})q^{-\alpha\beta}p_*^{\alpha} - p_*\hat{x}^{\beta} = (\beta^{\alpha\beta} - \beta^{\alpha})q^{-\alpha\beta}p^{*\alpha\beta} - p^*\hat{x}^{\beta}$$

(18) is obtained by substituting into (17) from (14) and dropping the (equal) last terms on each side of the equation. This reduces to—

$$(19) \quad \hat{x} = q^{-\alpha} \left[ \frac{(\beta^{\alpha\beta} - \beta^{\alpha})(p^{*\alpha} - p_*^{\alpha})}{(p^* - p_*)} \right]^{1/\beta}$$

The maximum loss may be found from (14) by setting  $x = \hat{x}$ . Although the comparisons are very crude, some interest may attach to the figures in the following tables. These compare net revenues and losses with two different production functions.  $\tilde{x}_*$ ,  $\hat{x}^*$  indicate equilibrium outputs at the lower and higher prices, respectively.

If  $x$  is taken as an index of total variable input, then Table 1 represents a case where most of the important inputs are variable and Table 2 a case where most of the important inputs are fixed. The latter tend to be short-run situations but there is also considerable variation by crop and type of farm organization.

TABLE 1  
 $\beta = .8, p_* = 1, p^* = 1.5, q = 1$

Input	Net Revenue		Loss	
	$p = 1$	$p = 1.5$	$p = 1$	$p = 1.5$
$\tilde{x}_* = .328$	.082	.287	0	.335
$\tilde{x}^* = 2.488$	-.405	.622	.487	0
$\bar{x} = 1.082$	-.001	.540	.083	.082

TABLE 2  
 $\beta = .2, p_* = 1, p^* = 1.5, q = 1$

Input	Net Revenue		Loss	
	$p = 1$	$p = 1.5$	$p = 1$	$p = 1.5$
$\tilde{x}_* = .134$	.535	.869	0	.019
$\tilde{x}^* = .222$	.518	.888	.017	0
$\bar{x} = .175$	.531	.884	.004	.004

The absolute magnitudes of figures in the two tables are meaningless but the relative magnitudes give a very rough indication of how minimax input behaves in two kinds of cases. For example, if one moves decimal points in the revenue and loss columns of Table 1 four places to the right and calls the results dollars, the minimax loss would be \$830, and the maximum loss for the most optimistic input  $\tilde{x}^*$  would be \$4,870. More complete tables using approximations to actual production functions would give some notion of the kinds of gambles faced in different situations whether or not one attaches significance to the minimax input. The same principle can be applied to several uncertain prices and to combined price and yield uncertainty, but the computations probably become rapidly more complex as new uncertain elements are added. Of course, it may be possible to find simplifying theorems or to formulate complex problems so that existing theorems may be used. It seems reasonable to conjecture that, in problems involving more variables, minimax loss applied to static models would lead to more diversification and in dynamic models to more provision for flexibility than certainty models.<sup>3</sup>

Turning now from game theoretic models to probabilistic models, these have been applied to several kinds of economic problems—e.g. inventory control (Dvoretzky, Kiefer, and Wolfowitz [3]; Holt, Modigliani and Muth [8]), farm production planning (Freund [4]) and policy determination (Thiel [19]). I should like to comment briefly on an interesting matter that has arisen from some of these applications, namely, the reintroduction of certainty-equivalence into the discussion of behavior under uncertainty.

<sup>3</sup> Since the first draft of this paper was prepared, suggestions by Swanson [18] for applying game theoretic methods to agricultural problems have come to my attention.

Hicks [6], ch. IX, suggested that behavior under uncertainty could be studied by constructing for each of various situations involving uncertain anticipations, a related situation involving certain anticipations that would have the same implications for behavior.

Lange [10], Ch. VI, adopted this suggestion and proposed a demonstration of the existence of an appropriate certainty situation corresponding to each situation involving uncertainty. The demonstration contains a serious logical error—the confusion of two different kinds of equivalence. He used an indifference map to argue that to each uncertainty situation there corresponds a certainty equivalent—a situation with certain anticipations that the decision maker would just be willing to trade for his existing uncertainty situation. Many would accept this proposition and it is a close kin of Von Neumann's continuity axiom. However, the fact that two situations are equivalent in the decision maker's preferences does not imply that his actions will be the same in the two situations.

Hart [5], Ch. IV., rejects such constructions maintaining that many of the effective methods developed for dealing with uncertainty—maintaining liquidity, postponing decisions, restricting the investment in highly specialized fixed capital—could be justified only by very peculiar certainty models.

These and various examples convinced many economists that the useful scope of certainty-equivalence models is very limited. (How often would an elevator manager empty and refill his bins if he treated any set of mildly fluctuating prices as certain?) Recently, however, workers using probabilistic models have demonstrated a kind of certainty equivalence.<sup>9</sup>

Suppose the actions  $x$  of equation (4) consist of a number of quantities to be chosen by the entrepreneur and that they can be put into a sequence  $x^{(1)}, x^{(2)}, \dots, x^{(T)}$ . Suppose that events can be put in a matching sequence  $z^{(1)}, z^{(2)}, \dots, z^{(T-1)}$  so that  $x^{(1)}$  is to be determined now on the basis of present information,  $x^{(2)}$  will be determined after  $z^{(1)}$  is observed,  $x^{(3)}$  will be determined after  $z^{(1)}$  and  $z^{(2)}$  have been observed, etc.

The  $z^{(t)}$  are regarded as random variables (or vectors) with known probability distribution. The entrepreneur seeks at time 1 to determine actions for the first period and strategies for subsequent periods so as to maximize the expected value of the criterion. He determines  $x^{(1)}, \sigma^{(2)}(z^{(1)}), \sigma^{(3)}(z^{(1)}, z^{(2)}), \dots, \sigma^{(T)}(z^{(1)}, z^{(2)}, \dots, z^{(T-1)})$  so as to maximize

$$(4) \quad E(u) = E\psi(x, z).$$

Now if  $\psi$  is quadratic and concave in  $x$ , the  $x^{(1)}$  that appears as part of the solution to this problem is identical to the  $x^{(1)}$  that appears as part of the solution to the modified problem described below.

<sup>9</sup> Simon [17], Reiter [13], Thiel [20]. Theorems proved in the latter two papers are more general than the one discussed here.



Consider an entrepreneur who simplifies the problem by taking expected values say  $\bar{z}^{(1)}, \bar{z}^{(2)}, \dots, \bar{z}^{(T)}$  of the variables (vectors)  $z^{(1)}, z^{(2)}, \dots, z^{(T)}$  and treats these as though they were infallible forecasts of the values to be observed. It would then be natural for him to choose  $x^{(1)}, x^{(2)}, \dots, x^{(T)}$  so as to maximize

$$(5) \quad u = \psi(x, \bar{z}) \quad \text{where} \quad \bar{z} = (\bar{z}^{(1)}, \bar{z}^{(2)}, \dots, \bar{z}^{(T)}).$$

The writers cited have shown that  $x^{(1)}$ , the actions to be taken now, are the same in these two cases. This is a very interesting theorem and the domain of empirical problems to which it can usefully be applied is important to see. Quadratic approximations are frequently good enough to be useful. On the other hand, some of the objections to previous certainty-equivalence suggestions would still seem applicable (though the theorem does allow postponement of some decisions, thus meeting one objection to earlier suggestions) and convincing.

This suggests that the criteria for some problems are not quadratic or that other necessary conditions are violated (Thiel notes that the theorem does not hold if the distribution of  $z^{(t)} - \bar{z}^{(t)}$  depends on  $x$ ). I believe one possibly very important limitation may be the existence of constraints on actions. If the conditions of the theorem are otherwise satisfied, but  $x$  is (effectively) constrained by equalities or inequalities, the theorem will generally not hold.<sup>10</sup>

Before concluding, I should like to note that, although theoretical discussion is concerned almost exclusively with solving given decision problems, formulating appropriate problems is one of the most difficult tasks in successful application. In interpreting a farmer's decision making in light of the proposed framework, it is necessary to recognize that the applicable sets of possible events, actions and strategies are subjective. Encouraging some farmers to consider additional possibilities may improve their decisions more than could be achieved by modifying their principles.<sup>11</sup>

A strategy may be viewed as a set of rules stating how to act in a variety of circumstances. The circumstances covered by the rules are the domain of the strategy. If an important event outside this domain occurs, serious new thinking is called for. Such an occurrence seems to me to be fairly close to Shackle's [15] events of high potential surprise and perhaps more manageable analytically.

These and other implications of the choice of possibility sets should be studied more carefully.

<sup>10</sup> Two exceptions (cases in which the theorem still holds) that now occur to me are the case in which  $x$  satisfies a set of linear equations and the case in which it is confined to a region so large that it contains the ranges of all of the  $\sigma^{(t)}$ .

<sup>11</sup> This was emphasized by R. A. King at a recent TVA research conference.

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## DISCUSSION: PROBLEMS OF UNCERTAINTY IN FARM PLANNING

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Dr. Hildreth has presented the constituent elements of a decision problem, and has interpreted the literature on two categories, as he defines them, of theories of decision making under uncertainty. These two classes

are game theoretic and probabilistic. He solves algebraically, graphically, and empirically, a simple problem using game theory principles. The production function, price of input, and range of product prices were assumed known.

The analysis generates a minimax solution (in this example, the level of input) that is optimum for the conditions specified, including the lower and upper possible limits for the price of the product. It is doubtful that we know the exact types of farm planning problems for which this principle has application. We were told that the maximum loss must be rather small, but that the principle may be extended to more than one uncertain price or that other types of variables might be incorporated into the model. It is likely that these extreme values will be available for some elements where probability distributions are not, but the spread between the values for some variables may be so large that the limits are not meaningful.

A number of farm problems are of a non-repeatable nature; farmers make certain types of decisions once or a small number of times in a lifetime, as buying a farm. Some have objected to probabilistic theories for such problems while game theories, treating events no further than being or not being possible, may be helpful here.

A considerable portion of the farm planning work has in effect consisted of applying the principle of certainty equivalence. For example, in setting up farm plans, often including livestock, values for variables such as yields and prices have been estimated by methods including the use of long-time averages, normal price relationships, etc. A plan is then developed where it is assumed that these exact values are appropriate. Frequently the fact that these values are uncertain will influence the solution. We have found from a survey of the influence of the recent drought on cattle operations in western Kansas that farmers do not behave as they would if feed supplies and feed prices were in fact stable. If feed supplies were less variable, more farmers would prefer a cow herd. With highly erratic feed supplies, this system is less well adapted because of difficulties of adjusting basic herd numbers in response to feed. Systems involving the use of purchased animals have an advantage because farmers can purchase the animals in the fall and can buy the number appropriate for the feed supply or for feed prices.

I believe a further appraisal of the work on both certain and uncertain problems can be effected through the use of the framework or elements of a decision problem as presented in the main paper. It enables the following questions to be raised: Are all the relevant events being considered, e.g. available capital? Are actions being properly associated with

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events through the strategy function? Are actions associated with consequences and the consequences in turn with the criterion function?

The input-output or production function work completed is of the type that is a consequence of an action and event. Although there has been some excellent work of this type done, it is unlikely that we have a sufficient bank of these types of relations to solve all the certainty problems and especially all the uncertainty problems.

Several examples of studies in weather probabilities, price forecasting, and price expectations could be cited. This type of information is of the type needed if probabilistic theories are to be applied, and might furnish ranges of the type needed for the game theory principle used in the main paper.

Our efforts at analysis of uncertainty problems is probably weakest in the area of ordering the consequences. Where the consequence can be simply measured, as by net revenue, the task is less difficult. But in many cases, the consequences cannot be ordered by one simple measurement. Two methods of growing wheat not only result in different average net returns, but there are other differences in the respective consequences, which include variability of income, measured different ways, influence on erosion, and on soil fertility. Two different soil conservation plans could be compared on average income, income the first year, income the first five years, variability of income, amount of soil lost, effect on soil fertility, amount of capital left for the household, etc. Empirical work has not developed to the point that we can reflect all these consequences in one simple measure, such as utility. The best we have been able to do is to state implicit functions or to measure what we can, and to make the collection of separate measures available to farmers, assuming that if a farmer knows these relevant measures he can make a decision easier and more consistent with his own preferences.

Hildreth argues that we should go beyond economics in our models. This view is consistent with others recently expressed that farm management should go in the interdisciplinary direction in contrast to concentrating on economics. Although much discussion could evolve about this issue, I believe it could be agreed that as a generalization the past work on uncertainty has emphasized economics, especially the role of price. How far an individual student of applied problems should proceed in carrying the problem through the entire framework has not been resolved. We were presented a consequence function,  $y = \eta(x, z)$ , a strategy function  $x = \sigma(z)$  and a criterion function  $u = l(y)$ . To do useful research, must each man derive all three functions, or can the work be done on a fragmentary basis, as we in general have been doing, with

the work later being integrated, perhaps by a more generalist type researcher?

Hildreth suggests that pointing out possibilities to farmers might help them more than trying to improve their theories. I would suggest that there may be some crucial information that, if discerned and derived, would enable some farmers to complete the analysis themselves. Results from the Interstate Managerial Study are encouraging. It was determined that farmers do possess analytic abilities. Evidence was detected that they use inductive and deductive reasoning, figure costs and returns, use marginal analysis, use insurance strategies, and they ably answered questions on the utility of gains and losses. Farmers may possess a basic methodology that would enable them to solve their uncertainty problems. This is not to say that methodology should not be taught or that the basic ability could not be improved. The basic framework of decision making presented here would probably serve as an efficient outline for those teaching farm management decision making.

If we are unable to solve an uncertainty problem in its entirety, as great a portion as possible of each decision problem might be reduced to certainty. Production functions do this, or approach it, as no functions consistent with logic have been derived without standard errors attached to the coefficients. Wheat yields are related, among other variables, to the amount of precipitation. However, a portion of the relevant rainfall comes before seeding. This information would be known, and through a production function could be used in making the decision as to how much wheat should be seeded. For this problem it could be used because the techniques of wheat production in many dry-land areas are such that a farmer can wait until seeding time before making the decision. The problem is still one of uncertainty, but with the production function a farmer can reduce the number of uncertain events to insect damage, storms, etc., and rainfall after seeding, in contrast to rainfall for a more inclusive period.

Although the theories for handling problems in uncertainty are not fully satisfactory, those with practical problems to solve may find some of the concepts useful. As Hildreth pointed out, the appropriateness of the theories is only one of the problems, and a solution of uncertainty problems in farm planning requires further a research skill in designing appropriate problems. Undoubtedly new problems might be studied, as one example the problem of whether to leave farming. A farmer may only have to solve this problem once but it may be one of the more important uncertainty problems he must analyze.

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## RELATIVE ROLES OF SURVEY AND EXPERIMENT IN FARM MANAGEMENT RESEARCH

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and

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IF WE wished to make our presentation as brief as possible, we would accept at face value a statement by S. W. Warren, "From the beginning farm management surveys have been based on the idea that 'every farm is an experiment station and every farmer the director thereof,'"<sup>1</sup> and conclude that survey and experiment were one and the same and be finished with the assignment. Instead of taking this alternative, however, we propose to show some of the main currents in the development of farm management research. We then discuss the three major approaches currently in use in farm management research and briefly evaluate survey and experiment as sources of data for each of the three approaches.

Our historical treatment deals primarily with developments and ideas expressed prior to the end of World War II. We feel that developments since World War II stem largely from earlier ones and are recent enough to be remembered by most of us.

Survey and experiment form the core of our discussion. However, we feel that an adequate treatment of the subject necessitates some mention of other sources of data.

We may well begin our discussion with the views regarding the field of farm management held by some of the early writers. In 1932 H. R. Tolley wrote:

"In the early stages of development of research in farm management, any project with an *economic* objective was likely to be classified as a farm management project, because most of the economic research pertaining to agriculture was being carried on by men whose primary interest was in farm management. . . . At the same time, many projects which pertained almost entirely to the natural science phases of agriculture were likely to be classified as farm management and carried on by farm management workers if they were conceived to involve a consideration of the 'entire farm business'."<sup>2</sup>

Thus we see that from the beginning farm management was a broad field, including everything which affected the "entire farm business," regardless of whether it was crop rotation, organization of enterprises, or

<sup>1</sup>S. W. Warren, "Forty Years of Farm Management Surveys," *Journal of Farm Economics*, Volume XXVII, February, 1945, p. 19.

<sup>2</sup>H. R. Tolley, "Definition of the Field," *Research in Farm Management*, Social Science Research Council, New York, 1932, p. 4.

production practices. We may note at this point also, that most<sup>3</sup> of the pioneers in farm management were agronomists; Roberts, Hays, Hunt, Boss, and Spillman were among the agronomists who became interested in farm management.<sup>4</sup> *The Annual Report of the American Farm Management Association* for 1910 shows that farm management was actually taught in the same department as agronomy in twenty-five institutions. In three institutions it was taught in departments of rural or agricultural economics.<sup>5</sup>

It is difficult, if not impossible, to fix an exact date as to when research in farm management began. Some authorities place the date as "around 1900."<sup>6</sup> Studies which had as their objective determining costs of producing agricultural crops had been made prior to this time, however. As early as 1870, the report of the United States Commissioner of Agriculture included cost of growing crops in Madison County, Illinois.<sup>7</sup> In 1893, G. W. Curtis and J. W. Carson published results of a mail survey on cost of producing cotton in Texas.<sup>8</sup> Also, in 1893 the United States Department of Agriculture circulated a questionnaire to "28,000 practical farmers" and to "4,000 graduates of various agricultural colleges who were engaged in farming," inquiring as to the cost of raising corn and oats.<sup>9</sup> These studies utilized farmer estimates of cost of production.

A major step was made by Hays of Minnesota in the development of farm management research as we know it today from the early cost of production studies. Even in his early work (1902) he was not interested in cost of production *per se*. Instead he was interested in cost of production for the purpose of organizing farms for greatest profit.<sup>10</sup> To collect information he used the route system. A "route statistician" kept records for a small group of farmers and these were later analyzed. (In 1905, Hays became Assistant Secretary of Agriculture and was instrumental in setting up the Office of Farm Management, with Spillman as Head.)

Around the turn of the century, George F. Warren of Cornell became interested in applying to the entire farm business a technique he had developed for obtaining from farmers information regarding orchards.

<sup>3</sup> G. F. Warren, a horticulturalist, and H. C. Taylor, an economist, are notable exceptions.

<sup>4</sup> G. F. Warren, "The Origin and Development of Farm Economics in the United States," *Journal of Farm Economics*, Volume XIV, January, 1932, p. 7.

<sup>5</sup> G. F. Warren, *op. cit.*, p. 6.

<sup>6</sup> L. A. Salter, *Critical Review of Research in Land Economics*, The University of Minnesota Press, Minneapolis, 1948, p. 13.

<sup>7</sup> Andrew Boss, "Forty Years of Farm Cost Accounting Records," *Journal of Farm Economics*, Volume XXVII, February, 1945, p. 1.

<sup>8</sup> *Ibid.*, p. 2.

<sup>9</sup> *Ibid.*, p. 1.

<sup>10</sup> *Ibid.*, p. 4, and Salter, *op. cit.*, p. 13.

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This technique, as all of us know, was the farm survey. According to Salter, farm management as a field of study developed from the cost account routes in Minnesota and the agricultural survey work in New York.<sup>11</sup>

In 1909 Taylor of Wisconsin began to use the individual farm reporting system to obtain data for farm management studies.<sup>12</sup> Warren and Thompson of Cornell began using the record book system, in addition to surveys, around 1911.<sup>13</sup>

Regarding the early work in farm management, we should note that these men were starting from scratch. They had no body of principles to guide their efforts as we have today. Their studies were general purpose studies to provide the facts and descriptions needed in developing courses in farm management and to provide the insight for a few relationships. The studies were generally of the whole farm business and included only its broader features. Primary interest was in the question "What are the practices followed by successful farmers?" Such a description fits most of the farm management studies made prior to World War I.

During the 1920's a major portion of farm management research concerned itself with the entire farm business.<sup>14</sup> A few enterprise studies were initiated during this period. During the same period another field of interest grew up, also, i.e., type-of-farming studies. These studies might be included among those which emphasized the whole farm approach. However, they have one distinguishing characteristic. They were begun, in a sense, as companion projects to the outlook program as a basis for "general advice as to what kind of farm organization and management adjustments might best meet the forecast condition."<sup>15</sup>

The type-of-farming studies were begun in the Bureau of Agricultural Economics under Elliott. He was not convinced that they were the final answer, however. He stated "Blanket recommendations for the so-called 'average' farmer are too indefinite. They furthermore are likely to be misleading, due to wide variations found among farming systems and farmers."<sup>16</sup>

Another area of farm management work that became prominent in the 1930's deserves special mention. We have reference to the input-output studies initiated under the Bankhead-Jones Act. These studies were an

<sup>11</sup> Salter, *op. cit.*, p. 14.

<sup>12</sup> Boss, *op. cit.*, p. 11.

<sup>13</sup> *Ibid.*, p. 12.

<sup>14</sup> Walter J. Roth and J. R. Tolley, "Recent Trends in Farm Management Research," *Research in Farm Management*, Social Science Research Council, New York, 1932.

<sup>15</sup> Salter, *op. cit.*, p. 26.

<sup>16</sup> F. F. Elliott, "The 'Representative Firm' Idea Applied to Research and Extension in Agricultural Economics," *Journal of Farm Economics*, Volume X, October, 1928, p. 483.

attempt to provide better data than could be obtained from surveys for use in developing optimum farm organizations.

Schultz criticized the search for "universal" input-output constants in a *Journal* article in 1939.<sup>17</sup> He stated also that the job of obtaining technical input-output data belongs in the production departments. In an excellent discussion by Black, however, it was pointed out that the search was not for "universal" input-output constants. Instead, the search was for input-output schedules. In the same article Black pointed out what is perhaps the current view regarding joint projects with agricultural economics and the production departments. He indicated that the role of the economist is to help plan the project in such a way as to yield results in the form needed.<sup>18</sup> Thus, present usage of experiments to provide detailed information for farm management research is but a logical extension of earlier ideas on the subject.

Traditionally, research workers in farm management have used the results of research in production departments in plying their trade. In fact, some writers thought of farm management as primarily a coordinating science. Tolley wrote:

*"... it will be seen that farm management is a coordinating science. It brings together the results of research and knowledge from the other sciences and studies them with the end in view of determining how to organize his resources (or combine the factors of production over which he has control) so as to obtain the maximum economic return, broadly interpreted, from their use."*<sup>19</sup>

Wilson stated:

"Certain types of economic research must draw from the physical and biological sciences. . . ."

"Farm organization research involves bringing together and synthesizing the material from enterprise studies and from the biological and physical fields as well as the economic forecasts of supply and demand."<sup>20</sup>

From the foregoing, we see that from the beginning there has not been unanimous agreement among workers in farm management as to just what our job should be nor to just how we should go about doing it. Farm management is a young, growing science and we feel that the diverse opinions are merely growing pains and are nothing to get alarmed

<sup>17</sup> T. W. Schultz, "Theory of the Firm and Farm Management Research," *Journal of Farm Economics*, Volume XXI, August, 1939, p. 583-584.

<sup>18</sup> J. D. Black, "Dr. Schultz on Farm Management Research," *Journal of Farm Economics*, Volume XXII, August, 1940.

<sup>19</sup> Tolley, *op. cit.*, p. 11.

<sup>20</sup> M. L. Wilson, "The Source Material of Economic Research and Points of View in its Organization," *Journal of Farm Economics*, Volume VIII, January, 1926, pp. 8 and 11.

about. On the other hand, these diverse opinion are, we believe, responsible in part for the direction farm management research has taken over the years, i.e., they are partly responsible for the different research approaches currently in use and for the different sources of data used in connection with these different research approaches.

The three research approaches most widely used are (1) the traditional survey approach, (2) the production function approach, and (3) budgeting and linear programming. These three approaches are not mutually exclusive nor do they comprise a complete listing of the approaches used in farm management research. By and large, they are static approaches as opposed to dynamic approaches and many people feel that the problems of farm management or management of a farm are not completely answered by the results of these approaches but, currently and historically, they are the three approaches most often used in farm management research.

The traditional survey approach was pioneered by Warren. It deals with the entire farm and assumes that adjustments in organization and management made by successful farmers are appropriate for the less successful farmers. This approach is similar to the farm account approach where factors of success are determined as a basis for making recommendations for the less successful farmers.

The second approach, the production function approach, uses mathematical functions to estimate the changes in output associated with changing one or more inputs. Isoquants, or equal product relationships, also have been estimated by use of this approach, particularly for "fertilizer use" and "feed combination" problems. Aggregate production functions have been used for an analysis of the entire farm business.

The third approach, budgeting or linear programming, has also been used to deal with problems of the entire farm, as well as with those of individual enterprises. For problems dealing with the entire farm, the budgeting or linear programming approach first sets up a typical situation in terms of resources, possible enterprises, relationships among resources and enterprises, and expected prices. Next, an optimum plan or schedule of inputs and outputs is developed. The usual optimum plan or schedule is obtained by comparing alternative plans until a superior one is obtained; this is done in a sophisticated mathematical manner in linear programming and by use of trial and error in budgeting.

The traditional survey approach demands the use of survey information. Since the experience of farmers is the basis for making recommendations, data are collected from farmers. Experimental farms are a possible source of data for this approach. The Southern Farm Management Research Committee, however, concluded that the principal value of experi-



mental farm management units is demonstrational. Costs would be prohibitive if we were to have units to test alternative organizations.<sup>21</sup>

Survey data are also used for the other two approaches, but experiments are a better source of data for the production function approach.

Doubt about the accuracy of survey information has plagued researchers since the survey was first used. The possibility of memory bias is one of the most disturbing factors. Proponents of this approach, however, feel that compensating errors occur and that with a sufficiently large sample errors cancel out, resulting in a sample average very close to the true average. W. J. Spillman reported in 1912 that the differences were rather small between the pounds and value of milk sold by farmers as determined by survey and the actual amount sold as obtained from the creamery records. He indicated that the error in farmer estimates of the amount of milk sold was less than 1 percent of the total and that the error in farmer estimates of the amount of money received for milk was .0075 of 1 percent.<sup>22</sup> Early workers in farm management pointed out that careful schedule design aided materially in collection of accurate information.

Both survey and experimental data have been used in estimating production functions for technical units such as an animal or acre of land. However, since one of the major reasons for using this approach is to obtain continuous, precise estimates of the relationship between one or more inputs and an output, properly designed experiments appear to be better sources of data for this purpose. Properly designed experiments have the range of data and the low correlation between independent variables necessary for good estimation, while farmer experiences do not. Past experiments, however, often lacked the desired range of observations, since the physical scientists were generally not attempting to estimate continuous relationships. Experiments as a source of data for the production function approach also have another advantage. The effect of the variable under study is not confounded with the effect of other variables. In addition to the limitations of survey data indicated above, another serious limitation exists when survey data are used to estimate an aggregate production function. The level of inputs not included in the function is not the same on all farms. Such a situation leads to meaningless functions.

A traditional objection to the use of budgeting and linear programming coefficients based on experimental data is that inferences will be made

<sup>21</sup> "Limitation and Contributions of Pilot Farms, Management Units, or Experimental Units in an Economic Research Program," Mimeo., Southern Farm Management Research Committee, March, 1954.

<sup>22</sup> W. J. Spillman, "Study of Farm Practice vs. Field Experiment," *Society for the Promotion of Agricultural Science, Proceedings*, 1912, Syracuse, New York, p. 109.

to situations different from the conditions under which the experiments were conducted, primarily because of differences in level of management. We hold the hypothesis that differences in level of management are not as great as when the objection was first raised. Our farmers are becoming better educated. More effective dissemination of agricultural information has increased the rate at which new practices are adopted.

Much can be said for the use of survey data with respect to labor requirements for use in budgeting and linear programming. Experiments are conducted on small plots or with small numbers of livestock. Special equipment is frequently used for crops. Labor requirements per acre or per head of livestock are probably different from those encountered under farm conditions. Such a difficulty was encountered in an early attempt by Hays of Minnesota to use experimental data to determine cost of production of cereal crops.<sup>23</sup>

In conclusion, we feel that the present status of use of data from the two sources in solution of today's farm management problems results from the breadth of the field of farm management. Our feeling is that for certain uses, experimental data is more appropriate; for other uses, we would recommend survey data.

<sup>23</sup> Andrew Boss, *op. cit.*, p. 4.

## DISCUSSION: RELATIVE ROLES OF SURVEY AND EXPERIMENT IN FARM MANAGEMENT RESEARCH\*

DON KANEL

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Professors Tramel and Hildreth have given us a useful survey of research in farm management. The historical retrospect shows how various approaches have led to the use of either surveys or experiments and some of the problems that have led to changes from the use of one source of data to the other.

In reacting to this paper I found it helpful to utilize an approach presented by Earl Swanson at the winter meetings of this association.<sup>1</sup> Swanson's model can be used (1) to highlight my reservation about some of the argument of Tramel and Hildreth and (2) to enable me to add a few ideas about this topic.

Let us consider Swanson's production function  $y = f(X_i, Z_k)$  where

\* I benefited from criticism of the remarks made by my colleagues, Howard Ottonson and Robert Finley. The responsibility for the views expressed is, of course, my own.

<sup>1</sup> Earl R. Swanson, "Problems of Applying Experimental Results to Commercial Practice," *Journal of Farm Economics*, 39:382-389, 1957, see particularly pp. 382-386.

$y$  is output,  $X_i$  are inputs treated as experimental variables, and  $Z_k$  are variables that are not studied in experiments, that are at a different level under experimental conditions than under farm conditions, and that vary among individual farms.<sup>2</sup> The  $X_i$  variables might be nitrogen and phosphate while the  $Z_k$  variables include such things as variations in slope, weed infestation, availability of labor, and managerial ability. In particular I will consider  $Z_1$  as managerial ability.

Tramel and Hildreth point out two limitations of surveys compared with experiments. (1) Experiments are designed to eliminate correlation among independent variables. (2) In experiments the effect of the variables not studied ( $Z_k$ ) is randomized and they are either held at a fixed level or their variability is reduced below their variability among farms. Tramel and Hildreth, however, do not take into account the effect of the non-experimental variables. In particular, they dismiss the most troublesome variable, managerial ability ( $Z_1$ ), as not being a variable at all. By this assumption they reach the conclusion that experimental data have a clear superiority, and they do not have to face the difficult question of how to obtain relevant information for modifying experimental results for purposes of making recommendations.

Swanson distinguishes three possible situations relevant to the application of experimental results to farm conditions:<sup>3</sup> (1) Marginal products of the experimental variables ( $\partial y / \partial X_i$ ) are independent of the level of the other variables ( $Z_k$ ) and thus are the same under farm and experimental conditions. (2) Marginal products of the experimental variables are dependent on the level of the other variables but the substitution rates ( $\partial X_i / \partial X_j$ ,  $i \neq j$ ) are independent of the levels of the other variables. (3) Both the marginal products and the substitution rates are dependent on the other variables that vary among farms. To ascertain which situation is true is a factual rather than a theoretical problem.

For purposes of highlighting the role of managerial ability, I shall make the heroic assumption that the effects of all the  $Z_k$  variables other than  $Z_1$  can be taken into account in fitting production functions. This might be done by making all of them except  $Z_1$  experimental variables. With managerial ability remaining a nonexperimental variable, the conditions necessary for each of Swanson's situations can be stated. The first situation would require that farmers do not differ in managerial ability, and that their managerial ability is equal to that employed on experiment stations. The second situation would require that farmers vary with respect to managerial ability, but that any given farmer's managerial ability is equally low or equally high with respect to the use of different

<sup>2</sup> *Ibid.*, p. 382.

<sup>3</sup> *Ibid.*, pp. 382-3.

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inputs (that is, the change in managerial ability has the same relative effect on marginal products of all inputs). The third situation would require that managerial ability of an individual farmer varies with respect to his use of different inputs and also there is the variation among farmers.<sup>4</sup> When the problem is stated in this way it is difficult to escape the conclusion that the third situation is probably true.

If the difficulties in the measurement of managerial ability are as important for farm management research as they seem, the conception that farm management is a coordinating science needs reappraisal. The conception of farm management as a coordinating science is presumably an idea that physical and biological scientists discover production functions, while the contribution of agricultural economists is to discover points at which income is maximized on the basis of the given production function and the prices of inputs and outputs. However, the treatment of managerial ability of farmers as one of the inputs<sup>5</sup> of the production function makes the function a social as well as a physical-biological relationship. Farm management workers who want to make farm recommendations on the basis of their research results will have to more than cooperate. Somehow they will have to increase the precision with which managerial ability is taken into account.

Managerial ability can be taken as one of the inputs or else it can be stated that each farmer has his own production function, different from that of other farmers and from that of the experiment stations. With this way of stating the problem, two, somewhat separate, areas for

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<sup>4</sup>The statements made do not exhaust the possibilities. The first two situations described by Swanson could also occur if marginal products of different inputs were independent of managerial ability. In that case substitution rates would also be independent of managerial ability. However, in order that this be true, the production function would have to have the following characteristics:  $y = f(X_1, Z_1) = g(X_1) + h(Z_1)$ . This in turn would imply that the absolute difference in incomes achieved by two farmers with different managerial ability would be the same in two situations: (1) a situation in which they had identical though "small" amounts of resources ( $X_1$ ) and (2) a situation in which they had identical and "adequate" amounts of resources. Or to put it another way, the function described would imply that the contribution of managerial ability to output would not depend on the amount of resources in the firm. These implications would seem to be sufficient for denying much relevance to the situation described in this footnote.

<sup>5</sup>The concept of managerial ability is not carefully defined in this comment. It is treated as an input, and thus it does not include the function of choosing some optimum on a production surface. Rather it includes only those component qualities of management which are skills or timeliness in the handling inputs (for example: control of livestock diseases). Possibly this should be considered an aspect of "quality" of labor, but then the problem would reappear in the form of measuring that attribute in fitting production functions. In the Interstate Managerial Study carried on by Glenn Johnson and other members of the North Central Farm Management Research Committee a much broader conception of managerial ability is used.

recommendations to farmers become apparent. One area is that of farm recommendations which include resource substitutions (movement along the isoproduct curves) and investment of additional resources in the farm firm. The other is that of aiding farmers to increase their managerial ability and thus move from a present production function to a higher one.

Some research treatment of managerial ability seems necessary for making recommendations in both areas. It is needed to construct production functions of different groups of farmers, and, of course, research insights are needed to enable research and extension workers to aid farmers to higher managerial ability. Research and extension workers do make statements that some enterprises and some farm practices require more managerial ability than others. Research work might be attempted on increasing precision of such statements. The work need not be carried on as part of fitting of production functions. It might be carried on separately to obtain some input-output ratios relevant for budgeting and linear programming research. This, of course, is already being done in adjusting experimental results down to the levels attainable by farmers. What is proposed here is that theorizing and testing of hypotheses be pushed in this area even if the work is not at the sophisticated level of farm management research on allocation of resources.

Managerial ability has to be treated somehow in an appraisal of relative roles of survey and experiment. I have drawn some implications inherent in present concepts of production functions and in the treatment of management as an input. Experienced workers in farm management, who know the limitations of their procedures, might make sounder and more careful statements about these matters. Even if sounder statements can be made, however, this problem area either requires work on managerial ability, or else concepts need to be developed that show clearly why work can progress along present lines without the need to pay additional attention to management as a factor.



## SOLUTIONS TO THE PROBLEM OF LOW INCOME

Chairman: H. C. M. Case, University of Illinois

### SOLUTION TO THE PROBLEM OF LOW INCOME IN THE SOUTH: INDUSTRIALIZATION

RUFUS B. HUGHES, JR.

*Ford Foundation*

**M**Y COMMENTS should be taken as a word of caution to the personnel in the various industrial development agencies throughout the South. My hope is that they will take a broader look at the many aspects of the problem of low incomes. It is understandable that they should be enthusiastic for industrial growth and the increased material welfare it would bring to southern people. However, I fear that their enthusiasm has frequently led to overconfidence (1) in their abilities to induce growth in the South and (2) in the "short-run" efficacy of industrial growth in raising the incomes of people in the South to a par with incomes in other regions.

A most significant contribution would be to judge the prospects for future regional growth in the aggregate of nonfarm industries, using firm and reasonable assumptions regarding the parameters of the regional, national, and international economies. Unfortunately, such a contribution is beyond my analytical abilities and also beyond what can be accomplished by more competent analysts with available theoretical and empirical knowledge.

Largely such a judgment must be based on crude projections and limited analyses of recent trends. Of late these trends have been so abundantly projected and analyzed that what I say here must be somewhat repetitious. Looking at history, one may well conclude that the current problem is very much related to the South's failure to industrialize. However, in my own views, it would be unfortunate if, in looking to the future, we became overly convinced of the necessity or efficacy of the problem being solved by regional industrial growth. We must realize that the historic role that has been played by geographic differentials in industrial growth has been very much the product of the institutional setting in which our history unfolded.

Hence, the various aspects of our institutional pattern (as well as the chance and causally related industrial growth differentials) must be regarded as causes of the current situation. Comprehensive analyses of the means of changing the current situation would be unnecessarily sterile if regional industrial growth were treated as the primary cause (or means) operating in the context of current or historic institutions.

By current or historic institutions I refer to those that are not directly associated with regional industrial promotion programs.

As Professor Martin indicated at last year's annual meetings, recent trends in regional nonfarm growth do not suggest that the "worm of technical developments, resource discoveries, etc. has turned" so as to give the South great prospects for "catching up" with the nation in the near future. Certainly the growth in nonfarm jobs, expressed as a percentage of existing nonfarm jobs, has been more rapid in the South than in the nation as a whole. However, if the growth in nonfarm employment is compared with the natural increase in population, the South still appears as a laggard. And this is only a part of the picture; account must be taken of two additional issues:

- (1) A larger proportion of the South's workers are underemployed on small farms or in low wage jobs in towns.
- (2) A large part of the region's recent growth has been dependent on this superfluous population and their willingness to accept local industrial or commercial employment at very low wages.

In the term underemployment I have grouped two distinct concepts. The first concerns the failure of the economic system to allocate existing human resources to their most lucrative alternatives. This concept has been more adequately utilized in the analysis of the southern income problem, if not in the formulation of remedial policy. The second concerns the failure of the economic system to allocate more funds to developing the inherent capacities of southern laborers, so that the bulk of them would be suited for other than low wage occupations.

Before one becomes very optimistic regarding the future industrial growth of the region and the extent to which future growth may be expected to provide interregional income parity, it seems relevant to examine recent growth trends in terms of both types of underemployment.

Dr. Robock has estimated that from 1939-49 somewhat less than one third of the regional growth in manufacturing was induced by low labor costs.<sup>1</sup> The reverse side of this estimate is that, in the absence of the interregional wage differential (for comparable laborers), the regional growth in manufacturing employment would have been substantially reduced. I presume that labor adjustments and other developments have not been such as to substantially alter this situation today. If low wages were required for a considerable proportion of the recent growth in regional employment, it seems meaningful to question the extent to which low wage growth can reduce the interregional income differential.

Between 1940 and 1950, the eleven southeastern states had a net out-

<sup>1</sup> Stefan H. Robock, "Industrialization and Economic Progress in the Southeast," *The Southern Journal of Economics*, Vol. XX, No. 4, April, 1954.

migration of about 2,000,000 people. Conservatively, one might judge that 800,000 additional nonfarm jobs would have been required to hold this migration loss to zero, that is, about 9.5 percent more nonfarm jobs than were available in the region in 1950. If one assumes nonfarm personal income payments would increase in about the same proportion as employment, he comes to the undramatic conclusion that a 9.5 percent expansion of existing types of nonfarm employment would have raised the region's per capita income by about \$20. Obviously, if the interregional gap in per capita incomes is to be substantially reduced by local industrial growth, the growth will need to be concentrated in nonfarm activities that generate more income payments than those currently predominating in the South. In large measure industrial growth as a result of low wages merely transfers the problem of low income from a rural to an urban environment.

When one considers the prospects for regional growth in high income activities, he comes abruptly to question the capacities of workers in the South for high income employment and the other advantages or disadvantages of plant locations. To question the productive capacities of southern workers immediately involves one in arguments concerning the results of labor productivity comparisons that have been made between plants in the South and other regions.

Admittedly, several studies are available which show that plants operating in the South have been able to obtain high efficiency levels. Also many statements are available, from management personnel, attesting to the quality of workers in these plants. But to be realistic, we must place these studies and statements in the context of the situation under which the supporting observations were made. This situation is one of extreme labor surplus which enables existing industrial plants to be very selective as to the workers they hire. The following quotation concerning such observations seems relevant, "All the firms in which data was (were) available reported a higher level of formal education in their southern plant than in their northern operation. The results of the survey are clearly due to the fact that the new (southern) plants were able to skim the cream from the existing labor supply."<sup>2</sup> This raises questions concerning the adequacy of the marginal workers who would be encountered if regional industrial growth were more rapid or if the growth were in the high income activities which require more skilled workers. Comprehensive evidence on this score is limited. So far as I know the armed forces, alone, have had extensive experience in which the capa-

<sup>2</sup> N. A. Beadles, *Some Myths About the Character of the Southern Labor Force*. A Paper Presented to the Annual Meeting of the Southern Economic Association, November, 1954.

cities of southerners (in general rather than the "cream of the crop") have been compared with the capacities of people in other regions. I presume the recent draft rejection statistics reflect the judgments that have resulted from their experience. These statistics indicate that the rejection rate for southerners, because of mental deficiencies, was about double the rate for the nation. Certainly relative capacities for military service may not reflect capacities for industrial employment. However, at the present this seems to be the best evidence available.

Aside from labor costs, popular opinion looks to growing southern markets and the availability of southern raw materials and other nonlabor resources as important location factors.

No doubt there is a variety of finished and semifinished commodities currently imported from other regions that could be economically produced in the South. However, to regard local markets as a major locational factor, distinct from labor and nonlabor resources, is to propose that poor people can become wealthy merely through taking in each other's tattered laundry. This seems too fantastic to warrant serious consideration here.

Looking beyond labor costs and commodity markets, I have difficulty in weighing either the quantity or quality of the South's nonhuman resources. Certain things are obvious, i.e., that the South can compete favorably with the arid West for water using activities and that a large share of the nation's petroleum reserves are found in the West South Central Region. But the South in general does not appear to have a distinct advantage over most other areas in the potential availability of raw materials.

My comments, here, can be summarized briefly as follows:

1. There is little objective basis for the popular belief that the South will soon be able to solve its problems of underemployment without continued net migration to other regions.
2. For the foreseeable future, much of the region's employment growth will continue to be in low wage jobs and, hence, will have little influence upon the North-South income differences.
3. If the next generation of southern workers are to have equal employment opportunities with the workers of other regions, the adults of this generation must solve the current problem of providing their children with better educational opportunities and a set of institutions that will facilitate their movement to more adequate jobs whether these jobs are located in the South or in other regions.
4. Southern economists do not encourage the facing of these problems with their emotional insistence upon the quantity and quality of regional employment growth that must result from the regional availability of raw materials, the current high quality of southern workers, and the growing southern consumer market.

DISCUSSION: SOLUTION TO THE PROBLEM OF THE  
LOW INCOME IN THE SOUTH: INDUSTRIALIZATION

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In a provocative paper, Dr. Hughes has not only taken a dim view of industry growth as a solution of the South's low income problem but his analysis, in effect, holds little promise for any solution at all. His conclusions are (1) that in the near future, employment growth in the South will affect North-South income differentials very little; (2) that net out-migration is the only effective allocative device left; but (3) that out-migration largely fails to help southern people to increase their incomes because of the low investments that have been made in developing their inherent capacities. One needs only to admit the continuation of present North-South differentials in investments in education to have closed the door to solving the problem of low income in the South through farm-nonfarm resource transfers. Further admission of available evidence on nature of farm product markets leaves little else that farm people of the South can do but turn to increased agricultural self-sufficiency or to "taking in each other's tattered laundry."

In this summary I have omitted a few qualifying adjectives. Hughes' analysis, however, is questionable on both the effects of past industry growth and the region's growth potentials.

On past industry growth, he has ignored effects of the South's large labor supply on wages, hence has over-emphasized low quality of southern industry and people. True, much of the South's industry pays low wages. This comes about not because the South's natural and human resources are inferior, but mainly because of the South's large labor supply. This supply attracts industry in which labor services loom large in product costs. It also depresses wages in skilled labor industries. Hence, machinists, bricklayers, stenographers, and the like, all, receive lower wages in the South than do comparable workers elsewhere. Growth of employment in the South, even without a change in industry composition, will help to absorb the region's underemployment and to narrow the North-South income spread.

True, the hopes some entertain of income increases through new industry are too optimistic. The reason, however, is not that the South's natural and human resources are unsuitable for industry uses. Rather, the fact that a county lies in a large region of low incomes and underemployment, with no major barriers to labor movements and trade, is itself a formidable obstacle to a solution of its income problem. As a county attempts to absorb the underemployment within its bounds, it takes on



inescapably the underemployment of the whole area and region in which it lies. Hence, the surprise is not that such high hopes have failed to materialize but that local gains from industry growth have been as large as they are. Since underemployment in the South is region-wide, no county can appreciably lift its own incomes without sharing the burden of underemployment of neighboring areas. By the same token, though, progress in neighboring areas and in the South and the nation generally, helps to lift incomes in such county. Although southern industry growth has not yet closed the North-South income gap, the amount by which it will contribute to this may reasonably be expected to increase with each increment of new industry.

In evaluating the South's industry potentials, Hughes probably has (1) taken his view from only broad regional aggregates and averages; (2) viewed the South in isolation from the national economy; (3) failed to distinguish between actual and ideal industry location theories; and (4) failed to distinguish between development and location theory, or time and space dimensions of the southern problem.

Regional aggregates alone obscure much of the industry potentials the South possess even within limits of its internal markets and resources. The South is a large and diverse region. Besides textile, tobacco and garment factories, it contains coal, aluminum, iron, oil and chemicals, pulpwood, plastics, building board, distilleries, assembly plants for planes, tractors, and automobiles, major plants in the nuclear energy field, and many other kinds of service and fabricating activities that are part of a developing industrial complex.

Because the South is part of the Nation, its market and growth potentials are integrally related to those of our whole national economy. As the national economy grows, so will markets for products in which the South has distinct location advantages for part of the new needs. As national income grows, changes in components of the national product will be made which may alter comparative advantages among regions as well as among industries.

A theory of "ideal" location patterns fails to allow for the effects of the beliefs and decisions of people not conversant with nor bound by such theoretical frames. Many people have a strong inclination and economists even an uncanny genius for identifying the world as it is as both the ideal and the full measure of its potentialities. Often, however, progress has been made because people have "not known enough" to know that their goals were "impossible" of achievement. The issues raised here were debated in the 1870's. Then, too, the South's people were told and except for a few dissenters, were telling themselves that because of their limited capital and skills, hot humid climate and market disadvantages,

they could not compete successfully with New England in textile manufacturing. Yet that decade witnessed beginnings in southern textiles initiated by localities and people whose major resources were their own desperate straits and sheer faith. From these, we now have a new map of comparative advantage in textile manufacturing and industry branching out into many new lines making the South increasingly like the rest of the Nation.

The southern industry problem is not merely one of industry location as a problem of space, but one of economic development with a time and growth dimension. Economists still do not fully understand how economic progress is achieved. But aware of such limits, many continue to experiment in southern industry fields producing both more employment and new insights into the problems of growth.

Industry development is not a substitute for outmigration nor for farm improvements in solving the low income problem. Rather, each of these approaches has its place. Within appropriate limits each is supplementary or complementary, rather than competitive with the others. Hence, to depend upon one to neglect of the others is, in effect, a decision to prolong the low income problem.

Already, southern industry development has made important differences in both farm and nonfarm opportunities of southern people. It has brought new markets for fluid milk, poultry and eggs, fruits and vegetables, and other food products. It has increased the supply of capital and skills in the region.<sup>1</sup> It has had significant impact upon education and research and other socio-economic relations. Given continuing national economic growth, I predict that southern industry will gain momentum in the decades ahead and as it does that the South in its industry, incomes and levels of living, and other cultural features, will become more and more like the rest of the Nation.

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<sup>1</sup> These conclusions are borne out in a series of studies beginning with the excellent pioneering research by C. E. Allred and J. C. Fitch on *Effects of Industrial Development on Rural Life* in Sullivan County (See Vol. V, No. 3, Extension Series, University of Tennessee Record, 1928) in the Kingsport, Tennessee, area through to the recent well directed researches of W. H. Nicholls and his colleagues at Vanderbilt University.

## SOLUTION TO THE PROBLEM OF LOW INCOME IN THE SOUTH: FARM REORGANIZATION\*

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OUR SOCIETY has made rapid gains in increasing the level of living for a majority of our population. The productivity of our farms and factories is envied the world over. Yet, in spite of a rising real income for the population as a whole, some important segments are not benefiting.

One of these groups of people is the "neglected one-third" of agriculture which for one reason or another continues to produce relatively inefficiently in terms of production per worker. The problem of low incomes on southern farms is, in many respects, a part of the low income problem within agriculture and within the total population. Most of these individuals have handicaps, many of which are similar to handicaps faced by urban low income groups. Interest centers on the low income farmers of the South since regional as well as national economic and social forces have augmented individual family resource limitations and a large block of the low income families of the nation are situated in that area.

The persistence of low income attests to the complex nature of the causes and the difficulties of alleviating it. In response to this problem many questions are being asked. Why don't these people produce more for the market? What are their goals? What obstacles or restrictions do they face? How much do we know about reaching these farm families effectively with educational programs?

Low income, as other writers have pointed out, is a relative term.<sup>1</sup> It may refer to a group of families having lower incomes than another group. In another sense, the term is used to refer to farm families, who according to someone's set of value judgements, do not have sufficient income to maintain an adequate level of living. Low incomes occur when an individual, a region or the industry is unable or unwilling to make adjustments so as to provide an "adequate" income to the resource owners.

Since income is a return to resource owners for the productive use of resources, it follows that low incomes result from (1) lack of a sufficient quantity of resources, (2) inefficient use of resources to obtain

\* Journal paper No. 50 of the College Experiment Station, The University of Georgia, Athens, Georgia.

<sup>1</sup> See for example, C. E. Bishop, "The Economist and National Policy in Relation to Low Income Farm Families," in *Fertilizer Innovations and Resource Use*, Iowa State College Press, 1957.

money income, (3) low quality of resources, (4) lower returns to resource owners in agriculture than that same resource would bring in other industries, or (5) inadequate combinations of enterprises and practices to provide the highest income from the resources available in terms of the prevailing economic conditions.

Current trends in the economic development of the United States suggest that in the future, agriculture will be characterized by fewer workers, higher capital resources and greater output per worker. The present agriculture of the South is the net result of forces bearing down on the region over a period of years. An abundance of labor and a scarcity of capital has perpetuated an economy based on small farms and a substitution of labor for capital beyond that prevailing in other parts of the nation. Various factors have prevented or slowed movement of workers out of agriculture and movement of capital to agriculture. These regional and national maladjustments in resource use cause profit-margin problems to agriculture as an industry and within the region. The income problem on many low income farms, however, stems from a low level of production. The movement of families and hired workers from southern agriculture has negligible effects on the income position of those who remain if adjustments in size of business, production practices, and enterprise combinations are not made as conditions change. The income problem can be solved only if shifts are made within the distribution of incomes as well as to raise the level of the distribution.

A striking feature of the low income problem is the multiplicity of causes responsible. These causes arise from economic, educational, cultural and physical handicaps for individual farm families. Two additional observations appear to be important in explaining the nature of the low income problem. First, there is frequently not one but several limitations for a particular farm family. Second, these limitations are frequently interrelated. For example, if land is limited to the extent that income is low, capital inevitably becomes restricted. It is difficult to separate cause from effect. In this respect questions such as the following arise: To what extent is the lack of resources caused by the families' selection of goals or by the lack of managerial ability? To what extent are goals conditioned by the circumstances in which these families find themselves? To what extent will goals change as educational horizons are enlarged?

Solutions to the problems of low income have reference to courses of action for individual families, to institutions including government policy and local customs, and to conditions within the region, or the agricultural industry in relation to the total economy. Part of the problem deals with economic development or the lack of it. Finally, it must be

recognized that the problem is broader than economic alone, and solutions involve sociology, psychology and other disciplines.

### *Reorganization Potentials*

Technical possibilities exist for increasing incomes on most farms by making adjustments at the farm level. These adjustments are in the form of changing enterprise combinations, improving production processes, accumulating resources or in shifts of a similar nature. An indication of what can be done can be observed from successful farms where the operators have overcome obstacles and from the income potentials for varying resource situations obtained from farm management studies.<sup>2</sup>

### *Use of resources*

Farmers with problems predominantly of organization and management who have a desire to raise their incomes represent the group where educational programs can have the highest returns. The size of this group is probably not as large as many farm management specialists would like to believe. These farmers have the resources, and are limited only by their own skills and management ability. Farm families must reach this stage before moving to a higher income position.

The rapid changes in southern agriculture have intensified the need for technical and managerial know-how. Some families have low income because they have not made adjustments in their farm organizations in line with present opportunities of increasing farm income. In many cases an adequate farm organization of ten years ago, based on an abundant labor supply and on the sale of cash crops, does not provide an adequate income under today's conditions. In some cases the adjustments have not been made because a new set of skills are required. Other farm families have low income because they are just starting to farm. Generally farm management bulletins have had little or no effect in promoting analyses by farmers of their own operation. Generally, resources allocated to farm management specialists have been so limited as to offer only token assistance at the personal contact level. Most county educational programs concentrate on the technical aspects of farming. Guides for efficient use of resources under changing economic conditions receive minor consideration. For many families assistance in organization must precede or be in conjunction with the development of technical skills. One cannot be utilized without the other.

<sup>2</sup> See, for example, J. Gwyn Sutherland and C. E. Bishop, *Possibilities for Increasing Production and Incomes on Small Commercial Farms*, North Carolina Agr. Exp. Sta. Tech. Bul. 117, 1955; R. C. Woodworth and F. B. Saunders, *Evaluating Income Opportunities on North Georgia Farms*, Georgia Agr. Exp. Sta., Bul. NS34.



How can we teach farmers to make better decisions? Part of the answer appears to lie in the direction of stimulating thought in their own farm operation. A second phase of a solution lies in providing a framework for making rational decisions. Major difficulties arise in teaching principles to farmers who have had limited experience with abstract ideas and where only limited contacts are available. Case histories, economic analyses of physical experiments, and linear programming or budgeting studies can be most helpful in moving from a specific situation to the general principle.

#### *Limited resources*

A second group of farmers face problems of organization and management of an inadequate quantity of resources. Many farm families lack sufficient capital to use with available labor. Under these circumstances labor is substituted for capital to the extent that labor returns per worker are low. This phenomena is readily noticeable in comparing labor requirements per unit of production for different groups of farms and among areas. Similarly, the lack of a sufficient quantity of productive land on many farms frequently forces a low productivity per worker. An economic substitution of capital and land is a prerequisite for obtaining a higher marginal productivity of labor and hence higher family incomes. Many families have too few resources to obtain a high level of living even with adequate management.<sup>3</sup> The decision to stay in farming or to change to an urban job is related to an evaluation of income opportunities within agriculture in comparison with off-farm work.

An important aspect of educational programs for these families is to stimulate consideration of courses of action open to them. Some lack contacts concerning job opportunities and are not familiar with present job opportunity services. Others apparently consider their size of farm as fixed and give inadequate consideration to renting or purchasing additional land. Educational programs for these individuals should be broader than agriculture by itself and include employment possibilities and the development of skills for jobs outside of agriculture.

#### *Educational, motivational or cultural levels*

A third group of families face educational, motivational or cultural handicaps. The handicaps may be associated with goals, habits or customs not conducive to obtaining higher income. Many of these individuals

<sup>3</sup> For discussions of resource quantities on low production farms see J. C. McElveen and K. L. Bachman, *Low Production Farms*, U. S. Dept. of Agr. Inf. Bul. No. 108 and F. B. Saunders, *Economics of Resource Use in Farm and Nonfarm Opportunities*, Georgia Agricultural Experiment Station Bul. NS43, June 1957.

have meager contacts with community activities and sources of information.

Some families have a low priority for income and a high priority for leisure and minimum risk. To the extent that such families are currently using resources to maximize goals, programs designed to increase income by allocating labor resources from leisure to production would decrease welfare. Our inability to determine goals prevents a realistic appraisal of goal fulfillment. Since we lack more realistic measures, income is frequently used as an index of welfare and low income and low welfare are considered synonymous.

The essential feature of educational programs designed to reach this group is that noneconomic restrictions must be alleviated or by-passed before the people are receptive to management information. Conversely, management educational services may have a decidedly low productivity if these noneconomic barriers are not recognized. The most successful efforts in this direction seem to have been made through community or watershed organizations.

### *Physical handicaps*

A fourth group of families include those with physical handicaps. For example, 34 per cent of the farm operators in Georgia are over 55 years of age. Few of them are likely to make major changes in farm organizations or to move into nonagricultural fields. Other handicaps related to low income include poor health, lack of education and in some cases a low level of intelligence. A majority of these families are in the low income group.

Educational programs for these individuals may be desirable from a welfare standpoint. Many of these families need assistance in increasing income or levels of living, either within or outside of agriculture, depending on the nature of their handicaps and on personal preferences. Farm organization assistance should be secondary and a part of a general rehabilitation program.

In summary, farm organization assistance as a separate program to alleviate low income can be effective only when the causes are predominately economic. For many families cultural, sociological and psychological barriers must be alleviated before management assistance can be useful.

### *Effects of Institutions on the Potential for Increasing Income by Farm Reorganization*

Our institutions play an important part in determining the opportunities and restrictions within which farmers operate. Frequently these in-

stitutions are a carryover from a past era and need re-evaluation in terms of present conditions. Of special interest are social and economic institutions which effect decisions concerning farm organizations.

### *Social institutions*

In many areas of the South and among some groups a social stigma is attached to tenants. In the face of this social climate the opportunity of renting a suitable farm unit is not given serious consideration by many families. This is unfortunate in a region where capital limitations are severe, since the different gradations of crop, livestock and cash rents make it possible to use limited capital for more productive uses than real estate. The alleviation of this social stigma and the development of appropriate rental arrangements would increase the potential for some families to increase incomes by farm reorganizations. Similarly, among some groups of families with low income the fact that credit is not used has a higher social standing than among families with high incomes. While part of this problem arises from an aversion for risk, wise use of credit resources frequently is a prerequisite for profitable farm reorganization.

### *Economic institutions*

As the economic development of the South continues to gain momentum, the possibilities of increasing income by farm reorganization become increasingly important. Of particular importance are economic institutions which serve agriculture and particularly low income families.

One of the difficulties of increasing incomes in low income areas concerns a lack of development of markets. Markets cannot develop without a concentration of production, while production cannot expand without markets. There are instances, for example, where suitable soils and climate exist for raising vegetables, but these areas continue to have low income while vegetables are shipped from long distances to population centers within the region. The need is for the development of institutions to serve as a dependable source of supply and insure quality of product for the consumer.

The rapid growth of the broiler industry in Georgia and in other areas of the southeast illustrates the progress that can be made when institutions are devised which alleviate the restrictions limiting efficient production. Although the production of broilers is particularly suited to the resource limitations of an area of small, low production farms, the success of the broiler industry in low income areas can be attributed in large part to an organized and integrated attack on management, markets and credit. This integrated attack on problems and promotion brought

broiler production within reach of the capabilities and resources of low production farmers. It gave farmers with capital limitations and limited know-how a feasible alternative production system, and farm reorganizations were made rapidly.

The introduction of institutions combining credit, managerial supervision and marketing has the greatest potential for commodities (1) where the income elasticity is high and (2) where cost reductions and/or higher quality of product is forthcoming by integrating and organizing production and marketing. This description would seem to fit production of vegetables and specialty crops to a greater extent than production of corn, cotton or beef.

### Summary

The methods and techniques for solving the low income problem are not developed or known with a desirable level of certainty at the present time. Yet, we cannot say that we have exhausted the feasible alternatives. Additional long-range experimental programs in education with emphasis on developing the capabilities of low-income families are needed.

## DISCUSSION: SOLUTION TO THE PROBLEM OF LOW INCOME IN THE SOUTH: FARM REORGANIZATION

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First of all, Professor Woodworth has been assigned a rather imposing topic. One, I am sure he would agree, that will not be completely resolved today. However, he has done a commendable job of defining the low income problem as it pertains to southern agriculture, and likewise in formulating leads for a solution. Solution to the problem, he indicates, will ultimately depend on courses of action by individual farm families, particular conditions within the region, institutional adjustments, and the relative position of agriculture to the total economy.

As Woodworth sees it, inefficient use of available resources is a major income barrier. Of equal importance are (1) inadequate resources under the control of farm operators, (2) educational, cultural and physical limitations, and (3) limitations imposed by existing institutional arrangements. He discusses each category of limitations separately and indicates courses of action relevant to these farm situations. Moreover, farm reorganization potentials, Woodworth suggests, depend on certain prerequisites if farm management information is to become practical at the farm level. It is creditable that mention is made of the multiplicity of

causes that surround the problem of low income, and that its final solution will include insights offered by other disciplines as well as by economics.

Basically my point of view is such that I find it difficult to disagree with the general content and tone of the presentation. Therefore, my discussion will center about a few points where the emphasis might have been shifted, and one or two points of omission.

Certainly, I am in agreement when Woodworth indicates that we should experiment with alternative techniques, and emphases of education designed to detect and to combat determinable causes of low farm income. In some instances corrective measures may be a matter of degree; in others an alternative approach entirely.

Woodworth says, for example, that for those farmers who control adequate resources for enhancing their income position, finding ways to apply sound economic principles at the farm level may be sufficient. Demonstrations, experiments and research centering around budget studies and linear programming could bring desirable results.

As I have observed farming in the South, a more practical grouping of farmers for farm reorganization analysis would be based on the tenure and credit statuses of farm families. These would include (1) debt-free family farm owners, (2) encumbered family farm operators, (3) professional landlords, and (4) tenants including croppers. These categories of farmers place sufficient emphasis on individual operators as decision makers and at the same time encourage a more intense examination of institutions to control individual action at the farm level. Examination of existing institutions is usually only a passing reference or an after thought in most studies on the problem. Even then, reference to them is to stress that they are barriers preventing the free play of economic forces rather than to show how they could promote economic welfare.

With limited exceptions, debt-free family farm owners and even encumbered family farm operators fit Woodworth's idea of those farmers who could apparently increase farm income through more efficient use of resources and by accumulating more resources. Barring other restrictions, the position of these farmers on the tenure ladder permits them to implement their decisions once the implications of rational choices are clear. The encumbered operator is more handicapped in making and carrying out farm reorganization plans than the debt-free farmer due to real or fancied assumptions concerning the wishes of his creditor. This may cause an aversion of risks that new enterprises and new production practices entail. Minus such restrictions, however, the farms of both classes of operators may be reorganized to generate increased farm income if the managerial problem is solved. More research would be re-



warding regarding (1) adequacy of credit, (2) farmer responses to alternative credit supplies, and (3) how the farm capital market may be used to promote farm reorganization plans.

Our most baffling problem regarding farm reorganization in the South grows out of the unique pattern of landlord-tenant relationships. Enlightenment on the economic and social arrangement in this regard would require a historic dimension too lengthy and complicated to discuss here. Broad potentials of farm reorganization applicable to full owners and to encumbered owners are directly in conflict with the present institution of farm tenancy in those areas of the South where survival of the plantation is most vigorous. Observation would lead one to believe that for the most part, multiple farm units operated by tenants, are so far removed from equilibrium that any worth-while economic study regarding their adjustment potential must be predicated on moving them closer to an equilibrium position as a prerequisite. The condition has continued partly for cultural reasons, but largely for the fact that professional landlords have alternative investment opportunities and control farm resources in sufficient volume to permit inefficiency and still earn a tolerable income.

If farms of plantation scale are to be reorganized in an attempt to solve the income problem, while still employing the services of farm tenants, a fresh approach to landlord-tenant relationships is a precondition. This will involve decisions different from those of plantation owners who are successfully reorganizing their farms through the process of rapidly substituting capital for tenant labor and employing the services of hired and migrant labor. Unless the institution of farm tenancy in the South is reshaped, farm reorganization on plantations will inevitably lead to elimination of farm tenants in which case their income positions will rest not on decision pertaining to their farming operations, but on how smoothly they can shift to alternative employment.

I fully agree with Woodworth's implication, including those associated with life cycle of the individual, that physical handicaps are as frequent among farmers as among nonfarmers. He might have mentioned that the extension of devices like social security to farm families will do much to relieve the problem.

Like Woodworth suggests, increased production resulting from efficiency may not, in itself, be a final solution to the problem of low income in agriculture. There are sufficient cases in other sectors of the economy to indicate that even when efficient production is achieved income may not be automatically distributed for the general welfare. Achievement of this goal will require additional research and policy in the ongoing process of change and its associated problems.

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## INTEGRATION OF PRODUCTION, PROCESSING, AND MARKETING

Chairman: Larry Boger, Michigan State University

### GROWER-PROCESSOR INTEGRATION IN FRUIT AND VEGETABLE MARKETING

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*and*

NORMAN R. COLLINS

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AGRICULTURAL economists have been interested for some time in the integration of certain activities of farmers and their buyers and/or suppliers.<sup>1</sup> Recent research into the nature and significance of this phenomenon has centered mainly in the poultry industry. But John H. Davis recently stimulated broader discussion of this subject with his several writings on "agribusiness." Davis has framed his studies in terms of an application of various forms of vertical integration to all levels of agricultural marketing. The scope of this discussion will be limited, however, to integration at the grower-processor level. Although the intrafirm activities of individual processing and farm firms have been subjects of considerable analysis, agricultural economists have seldom examined the interfirm relationships between growers and processors within an analytical framework which viewed them as a form of vertical integration.

#### *What is Grower-Processor Integration?*

Grower-processor integration is the linking together—either contractually or otherwise—of farm and processing firms so that either or both relinquish certain decision-making powers in producing and marketing their products. Certain production and marketing activities of firms, which otherwise would make managerial decisions independently, become integrated under a single or joint decision-making unit. Thus, each firm does not simply strive for its own profit objective. Its actions in this regard are constrained by a new profit goal which must compromise the income objectives of the participants since no set of actions is customarily found which simultaneously maximizes the expected profit position of each.

<sup>1</sup> Ten years ago at these meetings, Dr. John D. Black urged agricultural economists to study this problem. "Guideposts in the Development of a Marketing Program," *Journal of Farm Economics*, Vol. XXIX, No. 3, August 1947, p. 616.

This may be considered as one form of vertical integration. The term vertical integration is generally used to indicate the coordination of decision-making processes of two or more stages of production. There are many gradations in the degree of such coordination. The limiting case is where successive stages of production are brought under unified management through ownership, either as the result of a merger of previously independent firms or through vertical expansion of one firm's activities by internal growth. Grower-processor integration usually is a less complete form of integration than that created by ownership. It covers fewer activities and decisions, is of shorter duration, and permits retention of ownership identity.<sup>2</sup>

### *What Factors Encourage Vertical Integration?*

The conditions encouraging integration of farm and processing activities may best be understood by examining circumstances in which there is little or no need for integration. Suppose a firm achieves optimum size when performing a single function and buys and sells in a perfectly competitive system of markets. The firm will not decrease its costs by performing additional functions of production. It can buy the kind and amount of a product it wants at prevailing market prices.<sup>3</sup> It would have no incentive to become vertically integrated with its sources of supply either through ownership or otherwise and would avoid doing so because this would increase its costs and decrease its operating flexibility.

In such a theoretical world, price coordinates (or integrates) the activities of buyers and sellers. And price would perform the coordinating job perfectly. With prices as their guide, farmers would produce the right products at the right time in response to consumers' demands as reflected perfectly through all stages of the marketing system.

But the real world departs markedly from this theoretical model. The cost conditions associated with some stage of production or marketing may be related to the decisions made in connection with another stage. And imperfect markets are the rule rather than the exception: market

<sup>2</sup> Some economists may disagree with the use of the term vertical integration to describe this relationship. For example, Oxenfeldt defines "control" of successive stages of production as "vertical extension" and reserves the term vertical integration for the case where such control is accomplished through ownership. Alfred R. Oxenfeldt, *Industrial Pricing and Market Practices* (New York: Prentice-Hall, 1951), p. 207. In research, however, economists often find this definition too narrow to be operational. For example, J. G. McLean and R. W. Haigh employ a definition similar to that used in this paper. *The Growth of Integrated Oil Companies* (Boston: Harvard University Press, 1954), p. 8.

<sup>3</sup> M. A. Adelman, "Concept and Statistical Measurement of Vertical Integration," *Business Concentration and Price Policy* (New York: National Bureau of Economic Research, 1955), p. 319. (Special Conference Series, No. 5)

knowledge is usually poor, not perfect; and buyers are often few, not many. The existence of such technological and market conditions may encourage firms to become vertically integrated to some degree.

### *Technological conditions*

Two technological conditions encourage integration. First, the physical input-output relationships of certain stages of production and marketing may be interrelated.<sup>4</sup> Technical possibilities existing at any particular stage are affected by activities and operations carried on in the performance of another stage. The classic case is found in the steel industry where, if such interrelationships are ignored, molten iron may be allowed to cool, moved to another plant, and then reheated prior to further processing. The economic importance of this is that the costs associated with certain functions are interdependent as a result of physical input-output interrelationships. Such conditions are important in processing fruits and vegetables since quality attributes such as color, size, degree of maturity, and absence of such defects as worm, mold, or insect damage, together with the timing and rate of deliveries to the plant, are affected by the production activities of the farmer.

The second technological condition relates to the costs associated with varying levels of output of a given function. The average costs of performing certain operations may fall continuously over the output range considered. Whether such functions with falling cost curves will be vertically integrated with other functions is affected by the nature of these cost conditions as well as by the characteristics of product demand. It may be that the revenue possibilities are too small to support a specialized firm or firms to perform this function. Stigler argues that the size and state of development of an industry strongly influences the extent of vertical integration of its component stages.<sup>5</sup> The particular application of this view for fruit and vegetable production and processing activities is developed below.

### *Market conditions*

Of considerable importance to both growers and processors is uncertainty as to future prices and as to future actions of the firms with which they are in immediate contact. The explicit joint decision-making process entered into by a grower and processor may include the objective of re-allocating risk between the parties. The processing firm is often willing

<sup>4</sup>George J. Stigler, "The Division of Labor is Limited by the Extent of the Market," *Journal of Political Economy*, Vol. LIX, No. 3, June 1951, p. 187. P. Sargent Florence, *The Logic of British and American Industry* (London: Routledge and Kegan Paul, Ltd., 1953), pp. 77-78.

<sup>5</sup>Stigler, *op. cit.*, p. 188.

to assume a major share of the price uncertainty if the offer of a price guarantee is included within an interfirm relationship where the producer agrees to perform certain services or provide products with particular specifications.<sup>6</sup> Since the cost functions of growers and processors are interrelated, the income position of each is sensitive to actions taken by the other and integrating their production and processing activities provides a method for reducing such uncertainty.

The need for eliminating uncertainty of the above types is increasing as a result of important changes occurring in the structure of the food distribution system. Most significant is the increasing concentration of buying power of a relatively few large retail chains and groups of independents. Retailers are now making active efforts to influence the characteristics of the products offered to them. Demand at the consumer level actually is a system of demands for a myriad of product classes where each class is defined by a particular set of product characteristics. Which of these class demands are passed on to the processor is increasingly affected by the profit determinants of the retailer. Therefore, the demand for agricultural products both at the processing and the farm levels has become structured in terms of a much narrower range of product specifications since only one or very few of the product classes are customarily chosen by the retailer. Many of the product attributes now desired by the retail organization—such as uniformity of product, stability of supply, and availability of large volumes—can be attained only through a rather narrowly defined combination of actions by both producer *and* marketing firms. The resulting sensitivity of the processor and grower income positions to actions of the other has encouraged increased integration in order to obtain the desired combination of actions. The demand functions the processor reflects to the producer is extremely complex. The more complex the set of specifications becomes for any product, the more difficult it is to reflect it to the grower solely in price terms.

The processor's problem is the more difficult because product attributes, such as those cited above, may be obtained only if the output from a large number of separate farms is coordinated. Usually the market organization on the producer side is characterized by a large number of relatively small firms and by a lack of a grower-sponsored mechanism to coordinate their offerings. In such cases vertical integration of the activities of a group of growers with those of a marketing firm has often proved an effective device to achieve desired horizontal integration or coordination at the producer level.

Uncertainties of the above types alone may not be sufficient reasons

<sup>6</sup> Further, elimination of growers' price uncertainty may lower processors' procurement costs by shifting the entire raw product supply function to the right.



for firms to become integrated with their sources of supply or market outlets. Experience in agricultural markets indicates that these factors exist in many markets where little or no integration between farmers and processors has developed. The influence of uncertainty is related to another market imperfection—the existence of fewness of buyers for the processing crop of an individual farmer.

Although farmers also face price uncertainty in markets of many buyers, in markets of few buyers this uncertainty is intensified. While farmers selling in competitive markets may be dissatisfied with the price they eventually receive, they know that the entire output always can be sold. But for most processing crops there are relatively few buyers in any given locality. The grower then is uncertain whether there will be an outlet for his products irrespective of price. Since perishability is so great for most fruits and vegetables, plant capacity may be overtaxed at peak harvesting periods resulting in lost tonnage.

Canners may also have strong incentives to control certain aspects of procurement in markets of few buyers. When a canner purchases an insignificant amount of the total supply, he can buy as much as he wishes without affecting the price. But in markets of relatively few buyers, this is no longer true. A processor must recognize that price competition at time of harvest will only bid up prices, not increase total supplies. Therefore, rather than be content with playing a passive role in accepting a share of available supply, processors have a strong incentive to make special ties with growers well beforehand. In annual crops this often means at or near planting time.

Many of these technological conditions and market imperfections are present in varying degrees in the processed fruit and vegetable industry.<sup>7</sup> Especially important are market uncertainties associated with price, product quality, and availability of supplies at the proper time. The costs of performing production and processing functions are interrelated by technological conditions. And the existence of relatively few processors as buyers of any given farmer's product amplifies the impact of these uncertainties. Factors are present, therefore, which encourage the integration of production and processing activities. The next question to be

<sup>7</sup> Another factor encouraging vertical integration is the desire to decrease transfer costs. Whenever ownership of a commodity is transferred, costs are incurred by buyers and sellers. If the successive stages of production and marketing fall under separate ownership units, many such transfers are required. Transfer expenses are reduced if the successive stages of production are placed under a single management. But industrial experience indicates that it is only when firms are few and/or products are differentiated that transfer costs may reach major proportions. In such imperfectly competitive markets, a vertically integrated firm can avoid the advertising and other nonprice costs associated with transferring ownership. Integration of growers and processors may also lessen nonprice competition among canners.

answered is: What determines whether such integration takes the form of ownership of successive stages of production or varying degrees of control over them?<sup>8</sup>

### *Integration Through Ownership*

Some processors grow a large part (and occasionally all) of their own raw product. But the great bulk do not because there are important technical diseconomies of integration through ownership.<sup>9</sup> The optimum size farm for fruit and vegetable production is considerably smaller than the optimum size processing firm. Management problems, to say nothing of the capital needs, associated with operating the acreages required for most modern canneries would be almost insurmountable. This problem is further magnified in firms processing a large number of different products. This trend toward more diversification of product lines is continuing. For example, California tomato canners process, on the average, 12 other products as well.<sup>10</sup>

Inflexibilities as to location and quantity of tonnage also arise when canners operate their own farms. Processors commonly disperse their acreage over a wide area in order to stagger delivery dates. Furthermore, many vegetable crops are grown within a well-developed rotation which includes nonprocessing crops such as alfalfa and grains. Such diversification of a processor's management interests would scarcely seem to be practical. Of course, these conditions would not be sufficient cause for not integrating through ownership if other advantages of such integration exceeded these diseconomies and if they were unable to achieve these advantages through nonownership forms of integration.<sup>11</sup>

<sup>8</sup> Because of time limits, the discussion of this paper is limited to noncooperative forms of grower-processor integration. But it should be recognized that fruit and vegetable processing cooperatives control certain of the production and marketing decisions just as do noncooperative processors and for the same reasons. Frequently, however, the extent of integration of cooperative members and their processing plant is much less than the economic optimum.

<sup>9</sup> It is very difficult to find data to substantiate a general statement for the nation as a whole on the extent to which processors produce their own raw product. California processors produce only minimum quantities of their own. Ohio, Indiana, and Wisconsin sweet corn canners grow 5, 6, and 22 per cent, respectively, of their own needs. R. C. Kline and M. E. Cravens, "An Economic Analysis of Processor-Grower Agreements in Growing and Marketing Sweet Corn for Processing in the North Central Region," Ohio Agricultural Experiment Station Bulletin (forthcoming). Other references to grower-processor relationships in sweet corn are based on this source.

<sup>10</sup> The authors have studied in some detail the nature and extent of grower-processor integration in the California tomato canning industry. These results will be given in "A Study of Grower-Processor Integration, with Particular Reference to the California Tomato Processing Industry," by Norman R. Collins, Willard F. Mueller, and Eleanor M. Birch, California Agricultural Experiment Station Bulletin, forthcoming.

<sup>11</sup> Often Wisconsin canners grow some early and late vegetable varieties on their

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Although the above reasons may discourage processing firms from growing *all* of their own supplies, there are certain strategic advantages in growing some of them. These are the advantages normally accruing to any partially integrated concern. When a processor grows some of his raw products and buys the remainder from farmers, production costs may be reduced below those of a separately operated firm. The reason for this is that during the peak delivery periods, when the processing facilities are operating at capacity, all of the canner's own tonnage can be handled at the expense of that owned by independent growers. Processors make considerable effort to use their plant capacities to the fullest during the entire harvesting season. In contracting for acreage which will produce satisfactory tonnage during the early and late parts of the season, it is probable that tonnage in excess of capacity will be available during the peak of the harvest period. Maximum delivery quotas, commonly included as a contract provision, are then enforced. The burden of this "over-contracting" may be shifted almost entirely to the farmer suppliers if the policy is followed of first processing all of the tonnage from the canner's own lands.<sup>12</sup>

Another factor that encourages processors to grow some of their own crops at times is that they face a supply that is less than perfectly elastic. In this event they may cut procurement costs by growing some of their own needs.<sup>13</sup> Some California processors have done this in periods of very short supplies. Midwest sweet-corn packers report that they, too, resort to growing more of their own needs when they have trouble obtaining adequate supplies at going prices.

#### *Grower-Processor Integration*

Although cost factors usually discourage processors from integrating with their sources of supply through ownership, the technological and market conditions discussed above strongly encourage nonownership

own land because farmers consider these varieties "too risky." Processors are willing to take a chance because if they are successful it lengthens their packing period. Of course, canners presumably could induce farmers to grow these varieties if processors assumed much of the yield uncertainty.

<sup>12</sup> This advantage is comparable to that of the partially integrated industrial firm which is always able to operate its raw product plants at capacity in times of slack demand.

<sup>13</sup> For example, a processor may wish to contract for 5,000 acres of tomatoes. But at going prices he may be able to contract for only 4,500 acres. He has three alternative ways of obtaining the additional acreage: engage in price competition, engage in nonprice competition for the marginal amount, or grow the additional 500 acres on his own or leased land. The first alternative would almost certainly increase the cost of his entire acreage, not just the additional 500 acres. The second might do the same although not necessarily so. But by the third method, he could obtain the extra 500 acres without raising the price paid for the other 4,500 acres.

forms of integration. Commonly, grower-processor contracts are the legal basis of such integration. A major integrating device of these contracts is the exclusive delivery provision. A farmer growing on such a basis agrees, usually well before planting time, to deliver for a specified price the entire crop from the contracted acreage to a particular processor; and the processor agrees to accept it. Each gives up an important management decision: the right to buy from or sell to whomever they wish at time of harvest. In addition, certain grower risks, particularly those associated with price, are transferred (at least in part) to the processor.

In most cases the extent of integration between growers and processors goes much further than this. Processors may actively control many of the cultural and marketing decisions ordinarily performed by farmers. They may control the time of planting, decide the most appropriate part of the farm to plant, designate the kind and amount of seed to use, the amount and analysis of fertilizer to apply, when and how much to irrigate, the type and extent of weed and pest control to use, when to harvest, the quality or maturity of product to harvest, and the rate of delivery. In varying degrees the existence of all the above practices involves the integration of the production and marketing functions of two separate firms. They give processors control over many farm decisions just as if they were producing the crop on their own land.

What determines the *degree* of integration between farmers and processors, that is, the length of time during which they are integrated and the number of managerial decisions that are placed under joint control? Some differences in the necessary degree of integration would exist among commodities; for example, quality control may be less important in processing tomatoes than in green beans. The concern here, however, is with the fundamental causes of differences in the degree of integration found for the same commodity over time and in different areas. Two conditions will be hypothesized as important in determining the extent of integration in a particular agricultural industry: (1) size and state of development of the industry, and (2) degree of specialization of growers.

Tremendous growth has been experienced in the fruit and vegetable processing industry. There are several reasons for this. A noted food technologist has observed: "Food processing has only recently emerged from an overgrown batch kitchen 'art' into a continuous industrial 'science.'" As consumer incomes have increased, there have been relatively greater shifts to fruits and vegetables than for most other food commodities. The pack of canned fruits and vegetables has nearly tripled in the past two decades. An even greater increase has occurred for frozen products. In order for the processing industry to attain this size, rather striking changes were necessary in the supply conditions of the raw product. Producers had to be informed of the product attributes that were



most advantageous from a technical processing standpoint. The development of varieties especially adapted to canning and freezing was necessary. Growers generally lacked sufficient technical ability to perform this production task satisfactorily. Strong encouragement was given to the processors, therefore, either to produce their own supplies or to exercise very close supervision over the growers.

As the industry becomes larger and more firmly established, the need for such a high degree of integration may be reduced. In the fruit and vegetable processing industry, certain external economies of scale resulting from the transfer of educational work to the state agricultural colleges and extension services may encourage canners to disintegrate from production activities. Also, as an industry grows, specialized private firms may be able to perform certain functions more efficiently than can either processors or growers. For example, today several independent concerns grow practically all tomato plants and seeds for California growers. Such shifting of functions to specialized agencies results in the disintegration of some grower-processor activities. And there is a further lessening of the formal exertion of control over activities as their methods of performance become institutionalized.

Another characteristic of an expanding industry such as fruits and vegetables is that in the early stages new growers may be financially weak. Processors may be forced to finance some growers either because others consider them poor risks or because specialized credit facilities may not exist. The extent of integration will be widened if the processors assume more managerial responsibility for production operations in order to protect their investment. In extreme cases growers may be little more than their processor's employees. But as growers become financially stronger, the reduction in their dependence on processor credit will also lessen such processor control over their production activities.

The degree of specialization of producers also influences the degree of integration between processors and farmers. When vegetable production is carried on as a small enterprise of a diversified firm, growers often have less technical knowledge, lack specialized harvesting machinery, and generally take less of an interest in the crop than do farmers specialized in its production. Therefore, other things being the same, there is a greater need for processors to control a wider range of grower activities when farmers are not specialists than when they are. This generalization seems borne out by available evidence. In California few production activities of tomato growers are controlled by processors. Processors report that today most California tomato growers are specialists in their business who know as much or more than do processors' fieldmen.<sup>14</sup> Lack

<sup>14</sup> Some California tomato processors, who also operate plants in other states, report that they commonly must supervise more grower activities in these other regions.



of specialization also seems to be largely responsible for the close degree of grower-processor integration in the Midwest, where most of the canned corn and peas are produced. Wisconsin sweet-corn and pea growers usually are specialists in dairy farming and Indiana and Ohio sweet-corn farmers usually are specialists in dairying, beef, or swine production. In all three states sweet-corn farmers devote only about 10 per cent of their cropland to sweet corn. And many do not grow corn every year. In these states processors control a great variety of grower decisions. Interestingly, sweet-corn processors seem to control fewer grower production activities in Indiana, where farmers grow an average of 26.5 acres, than they do in Ohio and Wisconsin, where farmers grow an average of slightly less than 16 acres. This suggests that the somewhat greater specialization of Indiana farmers may make it less necessary for processors to control as many production decisions.

The degree of specialization and financial strength of farmers in a particular area varies considerably. This may explain why considerable variation is found in the degree of integration among growers of the same processor and in the degree of integration different processors practice with their growers. Some processors are less closely integrated with their financially strong or specialized growers than with others. Also, some small packers deal only with specialized growers because their operations are not large enough to warrant hiring fieldmen to direct growers' activities.<sup>15</sup>

When particular industries are analyzed, it is evident that the grower-processor relationship is expanded to include elements not necessary to obtain satisfactory technical coordination. Such additional elements may be introduced to arrive at an income distribution acceptable to each party. The types of managerial decisions crucial to technical coordination of production activities include specifications as to time of harvest, quality standards, and quantity provisions. The grower often has considerable discretion over both quantity and quality of the raw product. The processor, in carrying out his procurement function, is affected by decisions made relating to these same areas of managerial decision.

The profit objectives of both growers and processors are important in determining exactly the methods used to accomplish this technical coordination. Likely there exists no set of jointly made decisions on these matters that can make possible an income distribution satisfactory to both parties—say, an income level at least as great as the opportunity cost. These divergent profit interests thus hinder effective technical co-

<sup>15</sup> The above hypotheses as to what determines the degree of integration found in an industry at a given time may explain much of what is occurring in the broiler industry. Further, they suggest that disintegration in some respects will occur as producers gain technical knowledge and become stronger financially.

ordination of each firm's productive efforts. Reconciliation may be possible if the interfirm relationship is expanded to include considerations not essential for technical coordination but which alter the total income potential of the parties.

Many of the "services" performed by the processor are offered partly for this purpose, for example, the granting of credit; supplying of plants, seed, and other inputs at cost; and providing of technical advice.<sup>16</sup> Income is realized by the farmer which the processor exchanges for grower concessions on other matters.<sup>17</sup>

This discussion suggests that conflicting forces at work affect the degree of integration. Increased specialization of growers and the growth and maturing of industries work to lessen the degree of integration and the increasing concentration in processing and the increasing control retailers exert throughout the food distribution system have the opposite effects. These conflicting forces make it impossible to generalize as to the future degree of integration in particular fruit and vegetable industries. Case studies are perhaps the best way to do this.

#### *Some Implications of Grower-Processor Integration*

The wide use of grower-processor integration implies that the participants derive certain benefits from it. Our analysis of the economic basis of this practice suggests that it originates primarily in the desire to increase operational efficiency in marketing and production. But what of the other claims that are often made for vertical integration?

Contrary to the hopes of some persons, vertical integration *per se* does not insure either greater stability of farm production or prices and income more satisfactory to farmers. Those arguing that it will do so have misunderstood the basic causes of the behavior often found in vertically integrated, nonagricultural industries.<sup>18</sup> Vertically integrated industries, such as autos, steel, and chemicals, are able to adjust more readily to

<sup>16</sup> The extent of such services also will depend on the extent of nonprice competition among processors.

<sup>17</sup> Some "services" may initially be necessary to accomplish operating efficiency (for example, providing seeds to control quality) but are continued long after this need passes. The motive for them might have changed from that of achieving greater operating efficiency to providing a more satisfactory income distribution. When this is true, these elements of grower-processor relations no longer represent any form of vertical integration.

<sup>18</sup> We believe that John H. Davis' claims for the gains farmers may achieve through vertical integration are extravagant. He implies that vertical integration *per se* results in stability and, therefore, concludes: "In essence, the job confronting agribusiness today is that of finding techniques and devices which will provide the agribusiness sector of the economy with economic stability comparable to that which industry has achieved through vertical integration." "From Agriculture to Agribusiness," *Harvard Business Review*, Vol. 34, No. 1, January-February 1956, p. 113.

changes in demand and thus stabilize their profit position. But their ability to do so reflects to a large extent the high degree of horizontal concentration in these industries which places control over supply in a few hands. This degree of horizontal, not vertical, integration accounts for much of the difference between industrial and agricultural performance. Similarly, when farmers and processors become vertically integrated, the goals of production stability and satisfactory income levels will depend on more than the existence of this type of market organization. Of particular importance is the relative extent of horizontal integration on each side.

The variation that may occur in the performance of grower-processor integrated industries characterized by different degrees of horizontal integration is suggested by the following: (1) In the sugar-beet industry, farmers are tightly integrated horizontally largely as a result of government programs. Here farmers' prices are well above competitive levels. (2) In the California cling-peach industry, growers are horizontally integrated through a bargaining association and have their power reinforced through a state marketing order program. Here farmers' prices at times also are clearly above competitive levels. (3) In the California processing tomato industry, a quasi-bargaining association represents growers and the buying side consists of about 50 canners. Here farmers' prices seem to be around competitive levels. (4) In the Midwest, fruit and vegetable growers as a rule are unorganized and sell to relatively few processors. Here farmers' prices appear at times to be below competitive levels. Any conclusions about the distributive aspects of grower-processor integration, of which price determination is among the most important, may not be drawn solely from knowledge of the form of vertical industrial structure. The nature of horizontal integration is more critical to an analysis of this subject.

Similarly, the claim that vertical integration insures industrial stability is not valid. Vertical integration may facilitate better adjustment of supply to changes in demand than a nonintegrated marketing system depending entirely on price to perform this function. But unless considerable horizontal concentration in processing exists as well, serious instability may still arise because of the independent actions of processors. In part such lack of concentration at the national level causes frequent over and undercontracting of vegetable acreages with consequent wide variations in farm output. For example, between 1945 and 1956 California processing tomato acreage, on the average, varied more than 25 per cent from one year to the next. Similarly, processors of sweet corn as a group tend alternately to over and undercontract resulting in production cycles of

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about six years' duration.<sup>10</sup> Thus, the degree of production stability found in a particular vertically integrated industry may depend, like income distribution, on the degree of horizontal integration as well.

Our purpose is not to disparage the importance and significance of grower-processor integration. Previous sections of this paper have detailed reasons for this type of interfirm relationship that are important to both grower and processor. Rather, the purpose of this concluding section is to recommend caution in accepting the conclusion that certain important goals associated with production stability and with producer and processor income positions can be obtained solely through increasing the extent of grower-processor integration.

<sup>10</sup> Moreover, such wide production swings in grower-processor integrated industries may cause serious production instability in nonintegrated industries as the price support program for some commodities seems to have done.

## DISCUSSION: GROWER-PROCESSOR INTEGRATION IN THE FRUIT AND VEGETABLE INDUSTRY

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Since I am in agreement with nearly all the ideas presented in the paper by Mueller and Collins, my remarks will necessarily elaborate on pertinent points and add a few new ones.

At the outset, the authors limit their discussion of integration to the grower-processor level. Although they seem a bit hesitant to label all forms of grower-processor integration as types of vertical integration, their position is clear that it is vertical integration but usually a less complete form than that created by a single firm owning and coordinating two or more stages of production.

The key to their definition of integration rests within the process of decision making by the grower and processor. In an integrated scheme, managerial decisions become interdependent so that a single unit emerges which recognizes the income objectives of each. This necessitates that each participant relinquish at least some powers previously each held independently. Accordingly, the authors include even the simplest contractual agreement involving only an exclusive delivery provision with price stipulated as one degree of vertical integration. In this case, presumably each gives up a management decision at harvest time—the right to buy or sell to another person.

In my opinion, a simple contractual agreement of this kind is not a

form of vertical integration within the framework of the author's definition. This simple type of agreement merely reduces price uncertainty to price certainty for both parties. This forward contract is little different from an insurance policy that reduces the extent of an uncertain loss to certain terms. Or is it much different from a grain futures contract? The management decision is not relinquished; it is merely made at another time than harvest and the income objectives of each party need no consideration by the other.

One further question is whether the final outcome (profit-wise) to each participant is any different than it would have been if a freely competitive market prevailed. Conceivably, if a total crop were under contract in this manner, the final outcome for the grower might be no different—the interplay of price-making forces has occurred at planting instead of harvest. The outcome for the processor is dependent of course on the market for the finished product. However, the authors quickly point out that in most cases, many more management decisions (cultural practices, etc.) are stipulated in the contract. Thus, their point that the income objectives of each must be recognized is quite pertinent and most contracts result in some form of vertical integration as defined.

The authors discuss two technological conditions tending to encourage integration which are quite pertinent. The first is that the physical input-output relationships of various stages of production and marketing are interrelated. Thus, raw product characteristics of variety, color, size, etc., obviously affect the growers' production activities and in turn directly limit the production possibilities of the processor. These relationships encourage integration through operational efficiencies besides facilitating the reflection of consumers' wishes through the structure. Thus, advantages should accrue to society in the form of lower prices unless growers and processors have considerable market control. I agree that this becomes even more important in a rapidly expanding industry such as fruits and vegetables.

It is doubtful that anyone would disagree with the importance of reducing uncertainty as a strong force motivating integration. A contract at planting time reduces price uncertainty to certainty both for the grower as a price for his output and for the processor as a price of his input. However, it should be noted that while uncertainty—particularly price—is diminished in any one year, other types of uncertainty—for example, the letting of a new contract—may be intensified for the longer run. Growers may have no alternative such as an open market on which to rely should a new contract not materialize. As the authors point out, price uncertainty is intensified for the grower in situations where there are just a few buyers for his product—the usual case in fruit and vege-

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tables. This oligopsonistic nature of the processors results in unequal bargaining power between the grower and the processor. Except in periods of short supply, this will usually result in a fairly uniform price with any competition among processors taking a nonprice form. The grower is not likely to be forced to take a lower price unless location advantage allows a processor to wield monopsony power or some type of collusion is practiced. However, it would seem probable that if processors exerted any powers they might possess to drive down, growers would soon organize more tightly to give them greater bargaining power. Thus, integration tends to protect both the grower and the processor. Also, Collins pointed out in a previous paper that the practice of tenancy (prevalent in the production of tomatoes in California) creates an additional incentive to decrease uncertainty through contracts because landlords renting on a crop-share search for growers having an assured market outlet.<sup>1</sup>

I would agree that the processors's problem is tougher. Without a contract, he can exert little control over the quality of raw product he needs to satisfy the buyers of processed products. Although this is important, perhaps the more difficult problem confronting processors relates to coordination of supply to enable their plants to operate at or near capacity for as long a period as possible. Since the processor cannot depend on the price mechanism in an open market at harvest to give a satisfactory supply of quality raw product input, contracting assures a supply besides eliminating any necessity to engage in price competition.

Another advantage not listed by the authors accruing to the processor is the reduction in buying costs as a result of agreements with growers. Selling costs for the grower, although less important, are also reduced. Mueller and Collins mention that contractual agreements with many small producers by a processor effectively achieves a horizontal type of integration at the producer level. My opinion is that the relatively large processor who effectively integrates horizontally in this way contributes to "economic stability" in the industry. This would come as a result of controlling a portion of supply large enough to affect market price. However, stable price brought about by oligopsony does not mean stable income to the grower. On this point the open price contracts more characteristic of the fruit industry contribute more to income stability for the grower. Obviously, this is impossible without the existence of some open-market activity.

Concerning the author's hypotheses as determinants of the degree of

<sup>1</sup> Norman R. Collins, "Integration of Grower-Processor Activities in the California Canning Tomato Industry," paper delivered at the Third Annual University of California Tomato Day, February 20, 1957, Davis, California.

integration, I am in general agreement but would like to elaborate on the second one—that pertaining to producer specialization. Where vegetable production is a small enterprise on a diversified farm operation, the manager is necessarily limited in his technical knowledge for any one crop. The authors contend that this would create a more favorable atmosphere for a greater degree of integration to exist. A specialist grower would need less help in making management decisions than a non-specialist grower. However, the fact that a grower is diversified may mean he can afford to accept the price uncertainty involved. A basic reason for diversifying has always been to “have your eggs in more than one basket.” In my opinion, the latter characterizes the Midwest tomato grower and accounts for the fact that either formal or informal contracts are subject to renegotiation in years of shortage or excess supply. In this case, the degree of integration may be less than for specialized farms.

Regarding implications of grower-process integration, I would agree that vertical integration *per se* does not insure more stable agricultural production, prices, or more satisfactory incomes. If processors began to use their oligopsonistic power to squeeze prices below competitive levels producers would quickly organize more tightly for greater bargaining power. Because of this possibility, a form of vertical integration through contractual agreements will benefit both the grower and processor primarily through operational efficiencies primarily tied to an over-all reduction or reallocation of uncertainty. Society should benefit too, as neither the grower nor processor are seemingly in a strong enough position to hold cost advantages accruing to them for a very long period.

## AN APPRAISAL OF VERTICAL INTEGRATION IN THE BROILER INDUSTRY

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IN THIS paper I shall argue that the development of integration does not stem from the drive for gains from increased technical efficiency but from the drive to reduce risks and uncertainty—a reduction to be achieved by exercise of market control. Further, I shall maintain that efforts to explain integration in terms of technical efficiency are likely to prove fruitless; any technical efficiency obtained results from effective control.

In presenting my argument I shall devote my attention to three aspects of the problem: (a) the "efficiency" of the independent and integrated segments of the industry, (b) the over-all efficiency achieved by the reduction of risk and variability by integration, and (c) gains to the integrator achieved by exercise of control over a substantial proportion of the industry in an area.

First, however, we need a working definition and understanding of the term integration. The definition I will use is Fetter's:

"Vertical combination is that in which plural plants and resources of different kinds and at different stages of changes which products undergo from natural materials to more nearly final form are united in respect to ownership. Vertical combination (like horizontal combination) may be thought of either as a process of combining ownership or as a state of united ownership however attained."<sup>1</sup>

Some firms own all the resources in the production and marketing of broilers; however, the bulk of the resources devoted to raising broilers are owned by individuals. But if the "state of united ownership" is assumed to include agreement with the producer on the use of resources devoted to raising broilers as well as outright ownership, most firms in the broiler industry would very well fit this definition of vertical integration. And it is probably true that the use of resources in the producing enterprises are no different whether owned or "controlled" by contract.

Integration in the broiler industry varies from cases in which firms own the hatching, feed mixing, processing and producing facilities, to those cases in which one of the foregoing may have written contracts with producers and tacit agreements with the other two. Agreements with producers run the gamut from wage payments to profit-and-loss sharing.

<sup>1</sup> Frank Fetter, "Relative Efficiency of Large, Medium-Sized, and Small Business," *Investigation of Concentration of Economic Power*, Temporary National Economic Committee Monograph No. 13, Appendix D, p. 403.

*A. Are integrated segments more efficient than independent segments of the industry?*

Efficiency in the above question and in the reminder of the paper, unless otherwise specified, means cost reduction or lower costs of producing birds or in operation of manufacturing and processing plants.

It will be helpful if we keep in mind that efficiency as defined can be of two kinds, internal efficiencies (economies) and external economies. It is difficult to see how external economies could in any way be a factor contributing to the development of integration, since by definition these are economies external to any firm but accruing to the industry. As such, external economies would apply equally to independent or integrated firms. This is not to imply that external economies have not contributed to the growth of the industry. If one wishes to argue that size alone is a factor causing integration then indirectly external economies might be important.

Internal economies are those that accrue to a particular firm as a result of its size regardless of the size of the industry as a whole. These economies can be of two kinds—technological and pecuniary. The internal economies, as they are related to size of firm, have caused the greatest controversy among economists. In order to substantiate the proposition that efficiency is a major factor in integration it would be necessary that internal economies available to an integrated firm are not available to an independent firm. Theory alone, of course, cannot tell one whether or not a large firm is more efficient than a small firm. Evaluation must be based upon an examination of the evidence.

The following points are often cited as internal economies contributing to integration: (1) the least efficient units of the integrated firm are raised to the level of the most efficient plants. (2) High cost units can be closed and production concentrated in low cost plants. (3) Common ownership results in certain efficiencies. (4) Pecuniary economies which the independent cannot achieve accrue to integrated firms.

(1) It is argued that increased efficiency results from central management's raising the efficiency of the poorer plants or producers to the level of the best plants. In order to do this, new management practices or new technology must be introduced into the poorer plants. It is unlikely that many of those who were independent producers, are more efficient as part of an integrated firm because production techniques are similar and generally universally known.<sup>2</sup> As a matter of fact technology of hatchery operation, feed manufacturing, and processing is also generally known. And in this connection the development of new equipment

<sup>2</sup> R. L. Kohls and J. W. Wiley, "Aspects of Multiple-Owner Integration in the Broiler Industry," *Journal of Farm Economics*, Vol. 37, pp. 81-89.

and plant layouts is in the hands of manufacturers who are independent of the integrated broiler firm.

If efficiency is raised, therefore, it must be due to the integrated firm's being able to hire more highly trained management and specialists. This means that the integrated firm must have better management at all points from production to the finished products. It is possible for a trained field agent working with producers each day to raise, somewhat, their level of efficiency. It is highly doubtful, however, that independent plant managers are less efficient. There is certainly no positive proof that this is true. And there are compelling arguments that additional units (a) increase management accounting and similar expenses and (b) decrease labor productivity as a result of less direct contact and supervision. Investigation to determine whether integrated firms raise the general level of efficiency of all units within the firm will not prove very fruitful.

(2) Assuming some plants (hatchery, feed, or processing) are not operating at optimum levels, the control of more than one plant by a single firm would permit closing the inefficient and concentrating output in the more efficient. In the broiler industry it is difficult, if not impossible, to close production facilities in one area and shift output to a plant in another area as is frequently done in other industries. Further, it is highly problematical that all the processing plants which have been closed or failed were in each instance inefficient in a technical or managerial sense. Some have been closed because of location, reduction in output of birds in the region, inability or reluctance of producers to shift kind and type of bird produced, and numerous other reasons.

(3) A generally accepted statement is that common ownership of plants leads to greater efficiency. The reasoning is that large-scale operations are necessary to achieve efficiencies and that several independently operated plants can be operated more efficiently under single ownership and control. Blair presents rather lengthy evidence indicating that movement in many lines towards smaller scale operations is not compatible with first part of the argument or generalization.<sup>3</sup> That multiple-unit firms are more efficient than single-unit firms is seriously questioned by Fetter:

"... What technical economy of mass production could result from the mere common ownership of two or more duplicate plants? The one most plausibly claimed is that if plants are of varying degrees of efficiency the poorer ones will all be brought up to the level of efficiency of the best. This is a matter in which there seems to be no positive evidence. Even though no technical economies result from the larger size of combinations, there may be, and doubtless are, certain advantages to some persons and of some kind, or else there would be no such corporations formed. But personal advantage and private profit

<sup>3</sup> John M. Blair, "Does Large-Scale Enterprise Result in Lower Costs?—Technology and Size," *American Economic Review*, Vol. 38 (1948), pp. 121-152.



are no sure proof of technical economy. Important questions are, what sort of advantages result from this kind of growth in bigness; and who profits by these advantages? If the foregoing analysis is sound, it follows that industrial combination cannot make for economy of mass production in the technical sense, beneficial to the whole community, though it may create some other kind of advantages to those who form or control the combinations."<sup>4</sup>

(4) What of possible pecuniary economies of scale which might accrue to the integrated as compared to the nonintegrated firm? In the raising of broilers one would need to argue that the integrated producing units are larger. On the average they undoubtedly are, but we need here to compare a 30,000-bird per batch capacity independent with a 10-unit, 30,000-bird batch integrated firm. It is true that 10 automatic feeders, for example, might be bought at a lower unit cash outlay than can one. Or the purchase of 10 feed hoppers (and other similar equipment), may carry with it certain quantity discounts not available to the independent producer. Such economies would lead to a slightly lower long-run average cost curve for the integrated firm but it is certainly questionable that any significance could be attached to such differences. In the range of 30,000 birds per batch the slope of the economies-of-scale curve for the independent and integrated producing unit would be very similar and would approach constant costs. As a matter of fact, the integrated firm adds producing units which exactly duplicate one another and are comparable in almost all respects with independent firms of similar size.

Arguments similar to those for producing units apply to hatchery, feed, or processing plants. Some reduction in the unit cost of purchasing 10 scalders as compared to one may result, but again the per unit cost differences as a result of such savings probably are not significant. The technological operations of the two plants would be identical.

In addition there are pecuniary economies that result from an expansion of output brought about by an increase in size of plant. For example, a large motor results in lower per unit costs than a small motor. From available evidence, such cost reduction possibilities for processing plants appear limited. The economies-of-scale curve in ranges above 2,000 birds per hour, an output which includes most of the larger independent and integrated plants, is very flat.<sup>5</sup> There appears to be little data pertain-

<sup>4</sup> Fetter, *op. cit.*, p. 406.

<sup>5</sup> E. L. Baum, J. E. Faris, and H. G. Walkup, *Economics of Scale in the Operation of Fryer Processing Plants*, Washington Agricultural Experiment Station Technical Bulletin No. 7 (August, 1952). J. R. Donald and C. E. Bishop, *Broiler Processing Costs*, North Carolina State College A. E. Information Series No. 59 (June, 1957). R. O. P. Farrish, preliminary evidence of economies of scale in broiler processing plants in Connecticut and Del-Mar-Va, being completed by Storrs Agricultural Experiment Station in cooperation with the Market Organization and Costs Branch of the U. S. Department of Agriculture, indicates a rather flat economies-of-scale curve.

ing to the shape of the economies-of-scale curve for feed plants and hatcheries.

From the foregoing it seems that an integrated firm could achieve somewhat lower costs. However, such cost reductions are not of sufficient magnitude to cause the degree of integration which characterizes the broiler industry. Frankly, the core of the problem is not production costs, whether farm or plant. Time and effort devoted to this phase may not be very productive in analyzing integration.

There are two aspects of integration, neither of which has received sufficient attention from agricultural economists, that offer an opportunity to "hit the jack-pot." The first of these deals with risk and uncertainty associated with the operation of the "free market"; the second with monopoly and market control. In discussing these two points, I do not mean to imply they are mutually exclusive; neither are they entirely independent of the previous discussion of efficiency.

*B. Does integration increase the over-all efficiency of the industry by reducing risks and variability?*

Much of the impetus toward integration stems from the costs of irregularity. A rather compelling argument is that each unit of the vertically integrated firm's output can be made to exactly match the requirements of units farther up the processing or finished scale. Fetter<sup>6</sup> is inclined to somewhat summarily dismiss this proposal by saying it is largely illusory unless outputs of plants at lower stages exactly match demands at higher stages. However, in my opinion, this is one of the most important points contributing to integration upon which empirical evidence should be marshalled, whether or not the outputs of each unit exactly match requirements of other units of the integrated firm. That the absence of assurance of a market outlet for chicks can "force" integration, was dramatically demonstrated in Connecticut in 1956. With one exception, all hatcheries were operating in a completely independent manner. Producers suddenly changed their production plans, cancelling large numbers of previously placed orders. In attempts to market excess chicks, hatcheries cut prices, presumably to levels closely approximating variable costs. To salvage some of their potential losses (varying from 8 to 12 cents per chick), the hatcheries made contract arrangements in many instances with producers who had previously cancelled orders, and thus were at least partially in the integrated broiler business. The "oversupply" of chicks could not be stopped in 21 days for the simple reason that hatcheries had commitments with hatching egg producers covering a longer period of time. Uncertainty of the future contributes not only to the move toward

<sup>6</sup> Fetter, *op. cit.*, p. 410.

integration but to inefficiencies in the hatchery and the hatching-egg producing firm.

In contrast, assume a completely integrated firm in the sense that it includes producing units, either owned or under contract—a hatchery, a feed plant, and a processing plant. Certainly the hatchery output can be made to exactly match the requirements of the producing units so that theoretically not a single extra egg need be set. Likewise, the output of the producing unit could be matched with the maximum needs of a processing plant in achieving minimum plant costs. Evidence of the cost savings that might result from the removal of the uncertainty the free market “forces” upon the marketing firm is given by a study made by the author in 1955.<sup>7</sup> This shows that egg cartoning and candling plant costs could be reduced 11 percent by the elimination of seasonality. Ninety percent of this cost reduction was due to reduced variable costs and 10 percent to fixed costs. In addition, the substitution of steady for fluctuating supplies permits a reduction in the collection costs of 27 percent. No additional production costs are incurred in producing an even supply of eggs, which would tend to offset the savings indicated.

Cost reductions achieved by eliminating uncertainties would accrue to the integrated broiler firm. As a matter of fact, assuming that the entire integrated operation were located at some given point, collection costs would become negligible.

Another risk factor contributing to “forcing” integration and which has not received adequate attention is the necessity for stability in employment of labor. Independently operated processing plants are often compelled, because of inability to obtain supplies, to discontinue operating for parts of days, full days, or possibly a week or more at a time. This results in (1) attempts by labor to slow down production if not paid on an annual basis, (2) increased labor costs per unit of output if wage payments are based on annual wages, and (3) loss of labor supply. The aforementioned egg study indicates the last point to be exceedingly important under conditions of full employment, even where the required skills are low.

Not only is the independent firm faced with these problems (which may lead to higher costs) but the lack of assurance with respect to output may limit the development of adequate markets. This is similar to the situation faced by the foreign manufacturer trying to sell to the American housewife. She proves a very reluctant buyer until assurance is given that adequate repair parts will be available for the genius of the house with his “Repair It Yourself” kit. Independent processors are met

<sup>7</sup> S. K. Seaver, *The Effect of Variability in Supply of Eggs Upon Wholesale Marketing Costs*, Storrs Agricultural Experiment Station Bulletin 331 (April, 1957).

with less than enthusiastic response from prospective buyers when guarantees cannot be made that a constant quantity and quality of broilers will be furnished every day in the year.

The foregoing is not meant to imply that all the risks are eliminated in integration. However, my hypothesis would certainly be that integration reduces risk and uncertainty in the operation of the business. The testing of this hypothesis and its relationship to cost reduction should prove fruitful.

*C. Do gains to integration accrue from control of substantial segments of the industry?*

The second aspect of the integration problem, which I indicated seems to have received little attention, is that dealing with market control. The risks and uncertainty resulting from the operation of the marketing system can be reduced only by gaining control over the uncertain and risky factors. And, if the foregoing is true, efficiency often only follows as a result of control.

It is my belief that integration is essentially a market phenomenon, especially so with respect to broilers. This stems mainly from the fact that the largest gains in marketing are from organizational innovations not marketing technology. Reorganization of the individual feed dealer will not result in substantial savings since he is faced with a great degree of uncertainty. Important savings will occur only when the marketing system is changed, e.g., feed dealers working in concert or combining with firms producing more finished products in which feed is used. Achieving such organizational innovations invariably involves some degree of control, either by a single firm or several firms in combination. Heflebower makes the following interesting statement regarding vertical structure of the markets:

"In some cases, by integrating vertically, an oligopolistic industry rounds out its pattern of control with monopolistic results which can be judged only on a case by case basis. The steel and aluminum companies' development of their ore sources and the forward and backward integration of the petroleum refiners are alleged to have this effect and it certainly has been true of motion pictures. The purposes of such integration may not be control, but the effect often is the transfer of competition from a vulnerable level, or the introduction of effective oligopoly and product differentiation at a level whose previous competitive performance disrupted the "stability" plans of the industry."<sup>8</sup>

With respect to the feed manufacturers' interest in integration two things seem apparent. One, the tremendous growth of the broiler industry

<sup>8</sup> R. B. Heflebower, "Monopoly and Competition in the United States of America," *Monopoly and Competition and Their Regulation*, ed., Edward H. Chamberlain (London: Macmillan and Company, 1954), pp. 124-25.



and its large demands for commercially mixed feeds injected a new "disrupting" force which resulted in emergence of small feed mixers in all the broiler areas and increases in output of existing firms. This disruption could be countered and stability re-established by assuring feed outlets either through contracts with producers, or in certain instances, outright ownership of some producing facilities. Two, because processors and hatcheries were integrated backward, the feed companies would soon lose control of their outlets, unless they also integrated forward—again either through outright ownership, contracts, or tacit agreements with more forward firms. The familiar "If you can't beat them, join 'em".

As Schneider<sup>9</sup> points out the main motive often given for vertical integration is to obtain independence from the market and the dominating reason for this is to secure or increase profits. He goes on to say that where Firm 1 puts out a product used by Firm 2, both operating under atomistic competition, profits are not increased by integration. But, if Firm 1 acts as a monopolist, then profits are greater after integration. "The mere fact, therefore, of the monopolization of one stage of production provides an incitement to vertical integration."<sup>10</sup> While we have not established monopoly as a fact at any stage in the broiler industry, we can surmise that feed companies, processors, or hatcheries may be characterized by large elements of monopoly. As a matter of fact a small hatchery and supplier of hatching eggs in Connecticut went to bed one night and woke up the next morning as the only supplier in the entire United States of the particular kind of bird for which processors were willing to offer high premiums. He has since opened branch plants in six important commercial broiler areas, with written contracts with hatching egg producers.

Another facet of market control is power to exclude.<sup>11</sup> Only two aspects will be considered—one, economies of scale; two, integration itself as a deterrent to entry.

Economies of scale can act as a real barrier to entry. The extent to which it may act is related to the shape of the economies-of-scale curve. Curves which are reasonably flat or tend to be flat in the smaller output ranges are not conducive to long-run monopolistic price raising. On the other hand, where the curve is reasonably steep at large volumes, the tendency would be for the maintenance of monopoly. Evidence indicates

<sup>9</sup> E. Schneider, "Real Economies of Integration and Large-Scale Production Versus Advantages of Domination," *Monopoly and Competition and Their Regulation*, ed., E. H. Chamberlain (London: Macmillan and Company, 1954), p. 211 ff.

<sup>10</sup> *Ibid.*, p. 212.

<sup>11</sup> J. S. Bain, "Economies of Scale Concentration and Entry," *The American Economic Review*, Vol. 44 (March, 1954), pp. 15-40. This article gives a more complete discussion of the entry problem in monopoly.

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that processing plant economies-of-scale curves are not likely to make the entry barriers very high.<sup>12</sup> Regarding feed manufacturing and hatcheries, available evidence does not permit even an intelligent guess.

Current information concerning the second point—that integration itself acts as a deterrent to entry—is, to my knowledge, almost completely lacking. Despite the lack of current data, permit me the part of the fool for the moment. My hypothesis would be that the present state of integration in the broiler industry presents a formidable barrier to entry.

Two interesting examples support this hypothesis. An independent hatchery in Arkansas has filed charges with the House Committee investigating the poultry industry that a processor has moved in as a middleman to make a profit buying and selling chicks. The hatchery operator maintains that feed dealers are forced to buy chicks through the processing plant instead of direct from the hatchery in order to have a market for their finished birds. The processor refuses to buy birds unless chicks are purchased from him.<sup>13</sup> The possibilities of the processor exploiting his monopsony position are readily apparent because he is now the only purchaser of chicks from the independent hatchery. How long will the hatchery remain independent?

Let's take a brief look at another example of the possibilities of financial and market control. Processor A in Maine has approximately 130 growers under contract, the operations of which are supervised by ten fieldmen. (Incidentally, this adds considerably to production costs.) The output under the control of this firm amounts to about 18 percent of the total Maine production of 43 million birds in 1956. One-third interest in a hatchery is owned by A, and one of A's hatchery partners is B, the fourth largest processor in the state. (Processors A and B are "naturally" competitive.) Processor A purchases feed for the 130 contract growers from a feed mill owned by Processor B.

In a second hatchery corporation, Processor A is in partnership with one of the ten largest suppliers of broiler hatching eggs in the United States operating in Maine, Arkansas, North Carolina, Georgia, California, Indiana, with main offices in Connecticut. This hatchery is owned by the Connecticut corporation; the buildings and egg laying flocks by Processor A.

Processor A also has a partnership with a brother, which contracts for the production of hatching eggs. These contracts are similar to broiler contracts—chicks, feed, and miscellaneous items are supplied to the farmer, the farmer furnishes buildings and labor.

Processor A's plant handles from 50 to 60 thousand birds per day, all

<sup>12</sup> See footnote five.

<sup>13</sup> *The Poultryman*, New England Edition (Vineland, New Jersey: August 2, 1957), p. 2.

completely eviscerated and approximately 20 percent pre-packaged. The bulk of the birds was distributed through Armour Meat Packing Company until about six months ago. The birds are now being distributed exclusively by an independent firm. This "independent" firm is headed by a former veteran fieldman of Processor A.

While it might take a Senator McClelland to determine all the financial manipulations, it is not difficult to visualize the interlocking partnerships and corporate capital arrangements, all of which could be brought to bear upon the "free entry" of an independent hatchery, feed company, or processor into the Maine broiler industry. It is a subject upon which present data permit reasonable speculation.

It is interesting to note that Heflebower has proposed vertical entry as a monopoly test. He says:

"Indeed much can be told of competitiveness by lack of vertical entry, at least under prescribed conditions. Where aggressive, strongly financed operators at any level do not integrate vertically, that indicates either (a) that they are obtaining preferential treatment or (b) that the adjacent level is performing satisfactorily in terms of efficiency and of cost-price margins. Thus the reticence of the chain stores to enter meat packing combined with the absence of evidence of preferential pricing points to the competitive performance of meat packing."<sup>14</sup>

The foregoing discussion of control in relation to integration should not be interpreted in the manner often followed by the courts. Monopoly power as viewed by the courts, and occasionally by economists, is usually measured by the quantity of the total supply which a firm or corporation has of the total output of the product in the United States. If viewed in this manner, it is questionable whether any single integrated broiler firm exercises much of any degree of monopoly power. But integration in a geographical or market area could give the firm a large degree of control over supply, distribution, and price and, therefore, monopoly power could be regionally great though nationally negligible. As pointed out, a single Maine processor controls approximately 18 percent of the 43 million birds produced in that State.

There are those who maintain that such instances are rare; that there are still large numbers of firms in the broiler industry; and that it certainly will be a long time before there is really danger from too much concentration. And even if monopoly develops on one side of the market, its power is balanced by a monopoly on the other side of the market—that the bargaining forces are balanced through the emergence of bilateral monopoly and/or oligopoly situations. However, vertical integration is one of the precise methods by which a balance of power is elimi-

<sup>14</sup> Heflebower, *op. cit.*, p. 127.

nated or at best reduced. That it is happening in the poultry industry there can be no doubt.

### *Conclusion*

In conclusion, the efficiency aspect of integration in the broiler industry and other segments of agriculture may merit some further attention by agricultural economists. It is highly problematical that very significant differences in technical efficiency of integrated and nonintegrated firms will be found—with one major exception. More attention should be focused on the possible efficiencies that may result from the balancing of output at lower stages in the productive process with the requirements at higher stages, including the savings in selling costs, which some insist are small. But most of our attention should be focused on the market control aspects of integration including (1) financial restraints on free entry, (2) optimal size of feed and hatchery plants, (3) geographic or market area control compared to the national market, (4) relationship of uncertainty in market outlets and distribution contributing to the trend toward integration, and (5) whether lack of integration is a test that the present bargaining power is sufficiently balanced, so that even though bilateral monopolies and/or oligopolies are the bargaining agencies, serious economic exploitation is not the result. This latter might lead to a contribution to the interesting question posed by A. C. Hoffman, namely, whether the consumer is better or worse off where successive monopoly or integration characterizes the market structure. The whole matter of market control as discussed in this paper is a difficult one, but one which holds promise for achieving significant results.

### DISCUSSION: AN APPRAISAL OF VERTICAL INTEGRATION IN THE BROILER INDUSTRY

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I disagree with Professor Seaver's argument that integration is purely a market phenomenon.

Two plants of equal size, one under independent management and the other as part of an integrated operation may not necessarily show significant differences in efficiency, given similar production conditions and managerial ability. This we will concede. The point is, however, that plants of integrated operations have been better able to increase their size to take advantage of economies of scale. It is necessary, therefore, to take issue with Seaver's thesis that economies of scale are of little

importance as a cause of integration in the poultry industry. The economies of scale curves for plants producing above 2,000 birds per hour is quite flat it is true, but it does not cease to drop even at much higher levels of output. Using the references Seaver quotes to deny the value of economies of scale, and from preliminary findings of work at the University of New Hampshire there is as much as 20 percent saving in labor alone as the size of the operation increases from 2,000 to 5,000 birds per hour. Even with a very flat curve the important measure of whether it is profitable to promote an increase in size of operation, is the quantity times savings relationship. A quarter of a cent a bird is quite significant when 5,000 birds are processed per hour. From evidence available there are considerable economies of scale.

If we are agreed on this then, the second point to be made is that integration has enabled firms to take advantage of economies of scale to a greater extent than would have been possible without integration. In other words, technical innovations and improvements have made integration a profitable reality and as such are an essential part of its appraisal. In addition, the credit necessary for operating capital to increase size has been more readily available to well established firms of an integrated system and the interest rate has probably been lower than for independents carrying their own risks.

Seaver prefers to argue that integration is predominantly a means to reduce risk and uncertainty and to exercise market control presumably for the benefit of the few. Most firms selling produce attempt to minimize risk and uncertainty within their own operations, but the rapid growth of the poultry industry and the fluctuations in prices created situations where independent and small segments of the industry clutched at straws offering some greater degree of stability than was apparent in atomistic competition. Feed dealers pushing sales with easy credit, hatcherymen willing to sell chicks at lower prices under contract as a means of staying in business and producers accepting contract terms because of no immediate alternative uses for their labor and resources, soon developed an interdependence.

Many producers willing to accept the terms of the integrated organizations, whether dominated by feed companies, hatcheries or processors have been able to stay in business despite carrying much of the burden of lower prices. This has probably retained resources in poultry production greater than would be expected with the market recession recently experienced. The competitive position of the buyer has improved but members of the producer and processing industries have found themselves even more dependent on one another and integration has been further encouraged.

A situation born of desperation has undoubtedly resulted in a drive to reduce risks and uncertainty for individual firms and integration has provided this opportunity. I wish to reiterate, however, that the opportunity was grasped and has been made possible and successful in great part because of the technological gains associated with size.

Turning now to the question of market control, the trend toward larger units will undoubtedly cause some to cry monopoly and imperfect competition. There is evidence that supply is less elastic because of contract growing and that consumer demand could probably withstand considerable price increases before declining. There may be some agreements between processors within regions on bidding away one another's growers but interregional competition is probably greater now because of the extended horizons of larger marketing firms. Consumers are in no apparent danger of losing their supplies or of paying more because of monopolistic pricing. If efficiency in production and processing can be measured by the pounds of chicken a consumer can buy per dollar, then the poultry industry has become more efficient. What proportion of this is due to integration and what to sheer technological developments cannot be stated. There is no factual evidence as yet, however, to show that integration has provided gains from monopolistic control of segments of the industry. The competition among larger integrated firms is still very real and continues to keep prices close to marginal costs. If the time should arrive, however, when the large integrated firms in geographically dispersed regions joined forces, then there should be some concern for the exercise of a market control which would be divorced from economies of scale and technological efficiency. This is not true at the present time.

Risks in poultry production and marketing are still much in evidence and although integration has not removed them it has made them more manageable by consolidation. To this extent it is a gain. Where individual decision making and so-called independence in production have been reduced we enter into the field of social relations. This has not been touched by Seaver but it could provide food for lengthy discussions on democracy in a capitalistic society. Is it better to keep a man in production by taking away much of his decision making and pay him half a cent a bird or allow him freedom of decision with no guarantees and force him out of business?

In conclusion, Mr. Seaver's paper has re-emphasized that there are many questions unanswered on the economic structure of the poultry industry. I would prefer he recognize, however, that few answers to such issues can be painted black and white and that the issue of integration, technological efficiency and market control has a distinct tinge of grey.



# THE LAND MARKET AND ECONOMIC DEVELOPMENT

Chairman: R. E. HUFFMAN, Montana State College

## PREVAILING LAND MARKET FORCES

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**I**F THE market for farmland were similar to those for other productive resources, our job of analysis and prediction would be less complex. Instead of a single market, or several closely integrated markets, land transactions occur in hundreds, and possibly thousands, of local markets, with no standardization, little exchange of information, and a minimum of competitive bidding. Further, the volume of transfers is often too low to permit the establishment of a level of prices that can be observed and reported objectively.

In addition to imperfections in the market structure and organization, the several unique characteristics of land as a commodity further complicate the application of conventional economic analysis. In addition to the physical products attributable to land, many other less tangible services and satisfactions contribute to market value and cannot be quantified for purposes of economic analysis.

More than any other productive resource, land has associated with it strong elements of tradition, social values, and beliefs as to its intrinsic "goodness." These elements change constantly over time and differ among groups of individuals. Problems of measurement usually exclude them from our analysis and we proceed as though income from land, as measured by physical production, should explain market behavior. When we obtain puzzling results, as in the last several years, some of us question either the data or the rationale of the market. Instead, the explanation lies in the oversimplification of our assumptions and in our inability to handle value judgments adequately.

The propensity of agricultural economists to limit their analysis of the land market to those economic forces that operate within the agricultural sector also has hampered a fuller understanding of past and current trends. With the growing interdependence of farm and nonfarm economies as a result of technology and specialization, the conventional compartmentation has become more convenient than realistic. In recent years, the market for farmland has reflected general economic trends and expectations to an increasing extent. For example, a much closer association can be observed between the gross national product and the price of land since 1940 than between land prices and net farm income, the various commodity price indexes, or most other economic indicators. The

demand for land as space is generated entirely within the nonfarm sector. The flow of nonfarm capital into land in most years since World War II has exceeded the rate of disinvestment. The widely held belief that land offers safety and protection of capital from loss of purchasing power during periods of inflation also serves to transfer nonfarm prosperity to the land market.

### *Trends in Market Values*

A brief review of developments since 1940 shows that market values rose slowly during the early war years; they lagged considerably behind the rise in net farm income and in the general economy. Both buyers and lenders were cautious because of the uncertainty as to the duration of World War II and because of the serious consequences that followed the collapse of farm income following World War I. By March 1946, land values were 70 percent above the 1941 level. They continued upward until mid-1949, rising an additional 25 percent. A slight dip occurred in the last half of 1949 in response to the minor postwar adjustments that occurred throughout the economy, but the upward trend was resumed following the Korean outbreak. Land values increased by 26 percent in the following 2 years, reaching a then-record high by mid-1952 that was 33 percent above the 1947-49 average and 169 percent above 1941. With the downturn in prices of farm commodities that began in the last half of 1951, the upward trend in land values was halted and they later turned downward until early 1954. However, the decline was only 4 percent. Then an unusual development occurred. Land values again resumed their advance, even though farm income continued to decline. By the end of 1955, net farm income had declined by 25 percent from the 1951 all-time high, but land values were 4 percent above their mid-1952 peak. Although farm income rose by 4 percent in 1956, land values increased by 7 percent, and by early 1957 land values were 15 percent above the 1953 low, and were still rising at midyear. This is the longest period in 40 years of record in which land values have moved counter to farm income.

What is the explanation of this seeming paradox? Have biases and distortions crept into our basic data? Does the index of farm real estate values reflect a true situation, the explanation of which must be sought in the quasi-economic area of subjective values or in the nonfarm sector of the economy? First, I would like to stress that the index pertains to farm real estate, rather than to land alone. We adhere to this definition in order to approximate the unit of land area and the improvements associated with it that are bought and sold in the market. Second, it is an index of *market value* rather than a *price* index, because it is based

on subjective estimates and not on actual sales. These estimates are obtained 3 times a year from 16,000 to 20,000 general crop reporters of the Department who are asked to estimate the market value of farm real estate in their localities. They are cautioned to exclude from consideration those properties offered or sold for nonfarm uses. In addition to the crop reporters, we maintain a mailing list of about 10,000 farm real estate dealers, local bankers, lawyers, abstractors, and others who keep in touch with local market developments. This group of special farm real estate reporters is contacted by mail surveys conducted in March and October. We obtain about 6,000 usable replies, which include a sample ranging from 12,000 to 15,000 sales of farm real estate, as well as the judgments of these reporters concerning volume of sales, supply and demand, and other features of the land market in their communities. We have found these surveys to be extremely useful in evaluating market forces and in supplementing crop-reporter estimates. In the many comparisons of trend in sales prices and value estimates we have made, we find little difference, although dollar levels may differ appreciably. Comparisons of the average values reported by the census, which are subjective estimates of farm operators, with sales prices obtained from tax commission data in selected states also confirm the general conclusion that estimates of market value are as satisfactory as sales prices for measuring change.

When our data indicated an upward trend in land values in 1954 contrary to expectations, we considered several possible biases in our estimates. The most obvious explanation was that crop reporters had become excessively influenced by the sale of a relatively few tracts and farms for nonfarm uses. We knew that the volume of sales had declined to a low level, and that local observers would have only scant basis for making their estimates. By the end of the year, however, the increases indicated by crop reporters had been substantiated by actual sales data obtained from dealers, and from scattered studies throughout the country. Sales data obtained by state tax commissions and private industry for purposes of determining sales-assessment ratios were used for check purposes. A national trend, rather than a series of local factors operating in selected areas, was underway.

The theory has also been advanced that the index is reflecting a long-term upward trend as a result of a general enhancement in the quality of farms. Investments in soil-and-water-conserving structures, and in drainage, irrigation and soil fertility, as a result of improved management practices, together with the modernization of farm dwellings, are partly responsible for the slow rise in market values. In brief, we are not

pricing the same kind of real estate that existed in prewar. As you know, this problem of holding the quality or productive capacity of a commodity constant over time for pricing purposes is not unique to farm real estate. It is a perplexing problem in constructing price indexes for tractors, other farm machinery, and even livestock.

A crude adjustment can be made in the farm real estate index for the increase in productivity if we assume that *all* of the increase in productivity in agriculture is attributable to the real estate component. Total farm output in 1956 was 13 percent higher than in 1947-49, and 36 percent above 1940. Thus, 0.88 acres would have yielded the same output in 1956 as was obtained from 1 acre in 1947-49. If this relationship is applied to the published index of 147 (1947-49=100) for March 1, 1957, an adjusted index of 130 is obtained. If a similar adjustment were made for the 1940-56 period to recognize the 36-percent increase in farm output, the increase in land values would be 166 instead of 202 percent as shown by the published index.

These adjustments have been suggested to illustrate the maximum amount by which the index could be distorted by the productivity factor, rather than to imply that all of the increase in productivity has been, or should be, imputed to land. They do not alter the previous conclusion that land values have advanced more than other groups of commodities and have moved counter to the trend in farm income since 1953.

#### *National Forces in the Land Market*

Several strong forces now operating in the national economy underlie the more local and regional factors such as farm technology, price support programs, and net farm income. The most obvious of these is the continuing decline in the purchasing power of money, which has prompted retention of ownership and strengthened the demand for land as well. Land has provided excellent protection against loss of purchasing power, having risen about 50 percent more than the general price level since 1940. Although this net gain is somewhat less than for stocks or urban real estate in some areas, frequently these alternative investments are not considered by people in rural communities.

A second national factor is the probable effect of the expected increase in population on the land market. Much publicity has been given to population projections and, until recently, "fifth plate" philosophy was offered as the solution to current production surpluses within a relatively few years. Work by Barton and Daly raises considerable doubt as to whether such expectations are justified, but the belief continues to be

held by participants in the land market that a "land shortage" will eventually occur.<sup>1</sup> The idea that "they are making more people, but no more land" has been expressed in many different ways by farm real estate reporters and in popular articles. Relatively little publicity has been given to our present production potential, however, and to the increased output possible from technological advances now known or reasonably foreseen.

A "scarcity value" of land arising from the pressure of the population on food supplies appears to be a rather remote possibility so far as the next generation is concerned. Although we do have a fixed land area, we are constantly making "more land" by increasing the quantities of food and fiber the land produces. How this is accomplished will probably be a more pertinent question than whether it can be done. Practically all of the 13-percent gain in farm output in the last 8 years has come from the additional capital and management applied to the same area of land, and these inputs also share in the increased returns. Although the market value of land (excluding buildings) declined as a percentage of total assets from 1910 to a low in 1942, a reversal of this trend has occurred since then. In 1957, land represented 60 percent of total physical assets in agriculture, or about the same proportion as in the early thirties.

Although many of the substitutions of capital for land on farms are spectacular, some equally significant developments in industry bear directly on the future price of farmland. New industrial processes for production of synthetic fibers, addition of antibiotics and growth stimulating ingredients to feeds, homogenized tobacco leaf, and synthetic production of carbohydrates and proteins are only a few examples. Perhaps a part of the increase in feed crops needed for future livestock production can be met in this way. The question could become one of whether livestock feed can be produced as efficiently by agricultural as by industrial processes.

The expanded federal highway program planned for the next 15 years has been viewed by some persons as an important new factor that is likely to result in a wider diffusion of the effects of an expanding economy on the land market, with consequent enhancement in values. Not only will it widen the area from which it is feasible to commute to nonfarm employment, but more potential sites for industrial plants, subdivisions, and recreational uses will be created. However, with increased emphasis to be placed upon limited-access highways, highway frontage alone will not necessarily result in higher values of farmland for nonfarm uses. Rather, the pattern that is more likely to emerge is a concentration of

<sup>1</sup> U. S. Department of Agriculture, *Farm Output—Past Changes and Projected Needs*, U. S. Dept. Agr. Agr. Inform. Bul. 162, Aug. 1956 and, *The Long-Run Demand for Farm Products*, Agr. Econ. Research, July 1956.



highway benefits around interchanges and at such other points where access to throughways is permitted. As the highway program unfolds, however, it is more likely that the greatly increased supply of land suitable for nonfarm uses will exert a downward pressure on market values because industry will have a wider choice of locations for new plants. Instead of further concentration of industry along throughways now built, the movement could as well occur along the new systems now in the planning stage.

These observations concerning the possible course of industrial expansion do not negate the probability that the pattern of population density, both now and in the future, will have a marked effect on the demand for land as space. The highway program will serve to direct the rate and direction of population shifts and to extend nonfarm influences to larger areas of land. Again, however, the value gradients from the growing edge of urban centers should be reduced as the supply of land with equally desirable location features is increased. Differentials between market values for farm and nonfarm uses would be narrowed, rather than increased, by the highway program, and a larger area of land will acquire site values.

The land market is also sensitive to national economic policy, and to the changes that can be foreseen, particularly those concerning agriculture. With the federal government committed to maintaining a high and expanding level of economic activity, and with the increasing confidence of people that the means exist for implementing this policy, investment decisions can be made with less uncertainty. Many people reason that agriculture will benefit from further growth in the general economy and that the long-term outlook for agriculture is still favorable, despite the decline in farm income. Commercial farmers, like their industrial counterparts, are willing to make and implement plans for expanding production so long as the economic climate appears to be favorable.

National credit policies have an obvious bearing on the cost of farm mortgage credit, although the effects on the farm land market are more obscure and less immediate than in the nonfarm sector. We have no evidence as yet, for example, that the recent increase in interest rates in central money markets has had any dampening effect on land values, even though farm mortgage interest rates have increased.

The growing conviction of many people that some type of governmental assistance to agriculture will continue regardless of political party has contributed much to the strength of land values in recent years. The exact nature of these programs, such as the crops involved and the level of price supports, is less important than the expectation that assistance will continue. To the extent that these programs reduce fluctuations in

commodity prices, or establish minimum levels, and thus stabilize farm income, the allowance to be made for risk and uncertainty can be reduced and lower capitalization rates can be used.

The behavior of the land market in 1953 provides evidence as to how people react to the possibility of a major change in the farm program. The transition from the previous high, rigid support policy to a new program, the exact nature and consequences of which were not immediately evident, introduced considerable uncertainty in the land market. In retrospect, I am certain that the dip in land values at that time stemmed primarily from this uncertainty. As the new program developed, and it was apparent that many features of the previous program would continue, the previous upward trend in land values was resumed.

### *Regional Factors*

Specific features of the farm program, such as acreage allotments, levels of price supports and the soil bank, are often cited as value-sustaining factors. Because they vary so widely, geographically, in their importance, I am inclined to view these aspects as regional, rather than national factors. For example, a convincing argument can be developed that the acreage-allotment and price-support program for wheat is the primary factor sustaining land values in a wheat area, and similar reasoning can be developed for cotton and tobacco areas. But in substantial areas of the country only a small part of farm income is derived from price-supported crops, yet land values have continued to rise in these areas at about the same rate as in areas where a particular program is of primary importance. Price supports for feed crops are responsible for higher costs in dairy, poultry, and cattle-feeding areas than would otherwise prevail. If land values were directly responsive to support levels, they should be inversely correlated with the price of land in such areas.

The conservation reserve of the soil bank program has several unique features that make it, potentially, more important in the land market than previous programs. Unlike the acreage-reserve, or other conventional price-supporting activities in which benefits accrue to those who contribute to crop production, the benefits derived from the conservation reserve are more closely associated with ownership of land. Control of the land for the period of the contract is necessary for participation and few leases provide for such control. The assurance of a known annual rate of return eliminates uncertainty and makes participation especially attractive in areas subject to extreme weather hazards. As annual rental payments are relatively uniform throughout a country, the rate of return possible from land of lowest productivity often exceeds the rate to be expected from farming operations. One might also expect that the acre-

age of land offered for sale would be reduced if the program provides owners with a rate of return they consider acceptable for continued ownership. Again, this result is more likely in areas where land varies widely in productivity and where rates of payment do not fully reflect this situation. An assured rate of return from the program that would supplement social security payments would encourage farmers now eligible for such payments to retain ownership of some farms that might be sold otherwise.

The adoption of new farm technology, hastened to some extent by the cost-price squeeze, has become a strong demand factor in sizable areas of the country. With many thousands of commercial farms still below the optimum acreage for efficient operations, farmers have continued to bid strongly for the limited acreage of land that comes on the market. Because they usually need little additional labor or machinery to operate a larger acreage, they can often realize larger marginal returns from the additional land than can a buyer who considers the land as a complete farm unit.

From a third to half of the all farm real estate transfers, in the Corn Belt and wheat areas involve purchases for farm enlargement. About half of these purchases were operated as single farms before sale, and the rest were parcels of land that were parts of other farms before they were sold. The basis for valuation and the problems of financing of such purchases differ appreciably from those for full-farm units. Many farm operators apparently view the purchase of additional land as the most desirable means of reducing unit costs and of increasing net farm income. To some, it can mean the difference between quitting farming, with its attendant capital loss and personal inconvenience, and being able to continue. Proximity to the present farm, and the extent to which the land available complements present farming operations are often more important in determining market values than productive value alone. Even excluding such considerations, budgeting of net income with and without the additional land usually justifies a higher value for land to be added to an existing unit than for land to be operated separately. When financing is necessary, a farmer-buyer can offer the additional security of the land he already owns and can draw on total farm income to meet interest and principal payments. High ratios of debt to consideration on such purchases involve less risk to both borrower and lender than with the more typical purchase of a full-size farm. We plan to explore the nature of the parcel market in a study now underway in selected counties in the Great Plains some of which were selected because of the high incidence of purchases for farm enlargement.

I see little prospect that the pressure to enlarge existing farms will

lessen within the next few years. With the spread in net farm income between the least efficient and the most efficient operators becoming wider, those who are most successful in adopting technological advances will provide effective demand for the relatively few opportunities to buy land that become available each year. Market forces are likely to capitalize much of the increase in income realized from fertilizer, irrigation, and better management practices into the price of land.

In recent years, the purchase of land by nonfarmers has been viewed by some persons as an important price-sustaining factor. Several features of the income tax law apparently make ownership of farmland attractive to nonfarmers in certain tax situations. Also, the purchase of a farm for eventual retirement has become more attractive in recent years because of the enhanced amenities of country living that have resulted because of modern living conveniences, good highways, and expanding urban centers. The assurance of social security or other retirement income is often part of such a decision. Because the basic motivations and reasons for the purchase of land vary so widely within the nonfarmer class of buyers, more needs to be known about these motivations and reasons, before the net effect of this type of demand on the market for farmland can be appraised.

#### *Factors that Affect the Market Supply of Land*

The almost steady decline in the volume of transfers of farm real estate since 1946 suggests that many of the same factors that have contributed to strong demand have tended also to limit the number of farms for sale. Market supply has not responded to higher market prices because both potential sellers and prospective buyers appear to hold essentially the same attitudes, beliefs, and value judgments concerning land. In most areas, at least half of all transfers take place between farmers. With present owners in a generally strong financial position because of past high levels of farm income and a low incidence of mortgage debt, foreclosures and other distress transfers have remained at or near an all-time low. Also, there is little evidence that most farm owners make any conscious comparison of rates of return possible from alternative investments. Once capital has been committed in land, there are several strong deterrents to disinvestment in order to obtain a higher return, at least during the last 15 years. Full-time owner-operators have substantial amounts of additional capital invested in machinery, equipment, and livestock which usually cannot be recovered fully in the event of a liquidation sale. The capital gains tax is also a consideration, particularly in areas where the advance in market prices has been sharpest and where the dollar value of the typical sale is sizable. By retaining ownership until death, a new



cost basis is acquired, based on the market value of the farm at that time, and no tax is payable because no gain was realized. The new owner may sell the property, subject to little or no tax on capital gain, or the inheritance process may be continued indefinitely. The increased use of sales contracts and trades in recent years in order to reduce or avoid taxes on capital gains provides additional evidence that provisions of the tax law have been a factor in limiting the market supply of land.

Apart from these economic considerations, which have tended to limit the acreage of land for sale, in recent years we have observed more frequent references to the rather elusive idea that "land is in strong hands." This can mean a relative indifference to current rates of return or to a lack of financial pressure to sell, as well as an emerging attitude toward land that is basically similar to that which has prevailed in central and western Europe for generations. Medici quotes several passages from Einaudi which appear to be as applicable now to certain parts of the United States as they were to Italy when they were written in 1934.<sup>2</sup>

"The land is not sold by comparing the marginal yield obtained from it with that which could be obtained by reinvesting the probable proceeds of the sale. Perhaps the only case which has some affinity with sales for "economic reasons" is that of the peasant who owns a little bit of land—and who sells in order to buy a larger farm. But to sell for the sake of selling, for the sake of a good bargain, so as to have a nice little sum of money in the bank, no, never. Such an idea never crosses the peasant's mind."

Einaudi sums up these basic attitudes and beliefs toward the disposal of land in the following paragraph:

"Land for sale does not appear on the market until one or other of the events above described occurs; economic convulsions, as in the post-war years; the ruin of a peasant family due to idleness, or in the case of gentry, gambling, bad behavior or slow exhaustion and financial difficulties long disguised by the creation of debt. Apart from such circumstances, the axiom governing the normal economic conduct of a landowner is that land is *not* for sale. This is not economic axiom; it is born of instinct and is incomprehensible to the townsman. Those in whom that instinct works buy but do not sell. To sell is an illicit, immoral act, which their moral code forbids."

Can a conventional supply curve be approximated for land, even if these observations have only partial application to U. S. conditions? Unfortunately, most of the research in land valuation has been largely demand-oriented, and relatively little is known about the role of the seller. Yet the seller has performed an important price-making function in the market for the last 15 years, and he has also provided an appreciable amount of credit. Survey data show, for example, that about half of all land transfers in 1956 were sold at the asking price, and that the average

<sup>2</sup> *Principles of Appraisal*, Giuseppe Medici, pages 177-183.



difference between asking and sales prices was less than 10 percent. Nearly two-fifths of all transfers were financed by the seller. In the land-pricing study in the Great Plains mentioned earlier, we are attempting to explore the supply side of the market by means of personal interviews of sellers as well as of buyers. Attention was given to the factors considered by the seller in setting asking prices, as well as the bargaining process. These data are now being prepared for analysis.

### *Conclusions*

Because of the pervasive nature of the rise in land values in recent years, no one factor can be singled out to explain market behavior. Rather, forces can be observed at the national, and at the local and area level, some of which can be clearly labeled as "economic," and others that fall beyond the scope of conventional economic analysis. Certain attitudes, beliefs, and subjective values concerning land have emerged from the social and economic environment of recent years that have interacted with purely economic considerations to modify and, to some extent, to dominate market behavior.

Those who seek a simple and logical answer to the complex phenomena within the general framework of classical valuation theory, will probably question the emphasis I have given to the quasi-economic factors. Some will argue that *all* of the factors discussed can be arrayed in a single scale—that no valid distinction can be made between the physical products of land, and the other intangible services and satisfactions to be derived from land. All of these represent income, and are "economic" in character, even though some cannot be measured. Others may attach different weights to the factors, depending upon the particular market situation being appraised. Subjective values change constantly in response to the environment that creates them. Some gain in importance; others decline. None of them is ever a constant that can be fitted neatly into a mathematical equation.

## DISCUSSION: PREVAILING LAND MARKET FORCES

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Scofield has set himself two tasks: (1) to enumerate and discuss the important forces in the market for farmland in recent years and (2) to explain why farmland prices have risen since 1954, although farm incomes have declined moderately during most of the period since 1951. I will comment in turn on his discussion of each of these questions and will

conclude by referring briefly to several interesting questions suggested by his discussion.

In his delineation of forces in the land market there is little with which I disagree, although it seemed to me that Scofield underemphasized somewhat the delicate and infectious nature of some of the subjective expectations of buyers and sellers about the future. The more volatile these expectations are, the more sensitive we would expect farmland prices to be in the short run, since any change in such expectations is likely to result in simultaneous shifts both in the supply schedule and also in the demand schedule for farmland.

Scofield's discussion of the "intangible services and satisfactions" associated with the ownership of farmland consisted of a lengthy quotation from an Italian observer. Since the social and the land-tenure systems of Italy and the United States differ so greatly, it would have been more informative had he dealt directly with the role of these intangibles in the American farmland market.

His distinction between market *value* and market *price* was not at all clear to me. By value I am certain he did not mean what some appraisers call "normal value." In the present context I rather doubt the necessity and the validity of a distinction between market value and price.

The discussion of why farmland prices have been rising since 1954 although farm incomes declined from 1951 till 1956 was, however, somewhat less enlightening than one might have hoped. An altogether convincing explanation is not easy to come by. I shall, however, try to suggest several factors that, operating jointly, appear to be largely responsible. As a first approximation, let us consider the amount of the reduction in the present worth of an infinite stream of annual income payments if, let us say, the first two annual payments were reduced by half. The present worth of a perpetual stream of annual income payments of a given amount, with a 6 percent interest rate, is 16% times the amount of the annual payment. If the first two annual payments of an otherwise identical series of annual income payments bearing the same rate of interest were reduced by half, the present worth would be 15% times the amount of the third and later annual payments. Expressed otherwise, the present worth of the second stream would be only about 5% percent less than that of the first. Thus when the public anticipates only a *temporary* drop in farm income, it would seem that such an influence on farmland prices is relatively small and might easily be outweighed by changes in other factors in the land market. The popular expectations that government farm programs will be with us for a long time and that population increases will eventually improve farm-product prices both serve to make drops in farm income appear only temporary.

The changing factors in the farmland market that after 1954 outweighed the drop in farm incomes appear to me to have been (1) an increase in the pace of farm enlargement and (2) a growing expectation that inflation will continue for some time.

Although farm enlargement is often mentioned in discussions of the recent divergence of farm incomes and land prices, if this explanation is to be meaningful, it must be restated. Upward pressure on farmland prices would not be expected to result from farm enlargements alone but rather from farm enlargement together with a subjective preference on the part of farm people for farming over other employments. Changes in the technology of farm production and the accompanying cost-price squeeze are forcing many farmers to increase the size of their operation by buying more land. If farm people were subjectively indifferent between farm and nonfarm employment and mobility were perfect, the cost-price squeeze would also at the same time induce a sufficient number of farmers to shift to other employments. Farmland so released would then be available for the enlargement of remaining farms without upward pressure on land prices.

Both farm enlargement and agrarian fundamentalism have, of course, been with us for a number of decades. A recent acceleration in the pace of farm enlargements appears to contribute to the increase of farmland prices after 1954 while farm incomes were declining. Available empirical evidence is consistent with this view. The demand from existing farmers for additional land with which to enlarge their operations has risen from a quarter of all 1950 purchases to more than a third of 1955 and 1956 purchases.<sup>1</sup>

Growing awareness of the almost steady decline in the purchasing power of the dollar over nearly two decades is probably the second major cause of the recent divergence of farm incomes and land prices. After inflation has been experienced for some time, persons with money to invest would be expected eventually to begin to extrapolate the inflationary trend and to make investment decisions on that assumption. Such would be true of both farm and nonfarm people alike. On the basis of past experience, farmland then begins to look like a good way to invest one's money so as to protect the purchasing power of one's investment.

It is not difficult to construct a set of plausible reasons why in the last few years more people have come more surely to expect continued inflation. Unfortunately, however, it is extremely difficult to test such a hypothesis, either directly or indirectly. Relevant empirical data are not

<sup>1</sup> *Current Developments in the Farm Real Estate Market*, USDA, November 1956, ARS 43-46 (CD-45)

available. Hence this view, although plausible, is only an unconfirmed supposition.

Finally, Scofield's paper raised several interesting questions beyond the scope of his discussions. One is the question of which tenure groups benefit from government price supports and production controls. He is apparently of the opinion that, except for the conservation reserve, little of the benefits of government price supports accrue to the owners of the land factor. I question whether this interpretation is suggested by theoretical analysis or confirmed by the scanty empirical evidence available. A second question has to do with how well the institution of the land market is performing, both in the allocation of land among competing uses and also in the distribution of income among resource owners at one instant and over time.

# ECONOMIC DEVELOPMENT AND COMPETITION FOR LAND USE IN THE UNITED STATES\*

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## I. Introduction

IN THE following discussion I propose to examine the ways in which current developments in the American economy are altering the pattern of competition for agricultural land. In so doing I intend to draw upon the experiences of other developed economies, notably those of western Europe, where the process of competition for land has gone on longer and reached levels more intense than those experienced in the New World. The conclusion will contain some frankly speculative observations on the role of land in the future of American agricultural enterprise.

## II. The Impact of Technology

Perhaps no group of forces has had so great an influence on modern patterns of land use as has the expansion of technology. It has brought about basic structural changes in the pattern of asset ownership, and a consequent "deepening" of the investment of capital in American agriculture. This has taken place on a scale that parallels the 18th century revolutions in agricultural techniques that laid the foundations for western industrial society.

The dimensions of this technological revolution in agriculture are impressive in global terms. Investments in farm machinery and equipment in 1955 were 165 per cent greater than in 1940, when measured in constant dollars.<sup>1</sup> The index of use of plant nutrients (1947-49=100) stood at 48 in 1940, and at 165 in 1955.<sup>2</sup> Although beginnings had been made in the 1930's in the use of hybrid seeds, chemical pesticides and herbicides, and artificial insemination, the great expansion in these aspects of agricultural technology came during and especially after World War II.

The first great consequence of mechanization upon agriculture was to expand the extensive margins of land use. The tractor, the motor truck, and the grain combine were symbols of this technological change between the two World Wars.

In contrast to this earlier expansion at the extensive margin, the

\* Miscellaneous Journal Series Paper No. 956, Minnesota Agricultural Experiment Station. Appreciation is due Elmer Learn, Walter Baumgartner and Jerome Johnson for their comments and assistance in the preparation of this paper.

<sup>1</sup> USDA, *The Balance Sheet of Agriculture 1955*, p. 4.

<sup>2</sup> USDA, *Changes in Farm Production and Efficiency*, ARS 43-33, June 1956, p. 21.



changes of the past decade have had their principal impact at the intensive margins of land use. This is seen most clearly in the shrinkage in the acreage of harvested crops coincident with a continuously rising index of farm output.<sup>3</sup> The complex technologies of modern agriculture, the loss of farmland to nonfarm uses, and the rising opportunity cost of farm labor brought about by a full employment economy have combined to take large acreages of land out of arable agricultural production. This can be seen most clearly in the Northeast and in the Lake States; it is scarcely less significant in the Old South.

Another dimension of this technological revolution has been of particular significance in the Middle West. The effects of hybrid seeds, agricultural chemicals, and improved soil and crop management have been felt primarily at the temperature margins of land use, and not at the rainfall margins. As a consequence, land use changes of the past two decades have traced a northward movement for Middle West agriculture, but not a westward movement. The frost boundaries remain; the northern limit of corn harvested for grain is still set by the probabilities of killing August frosts. Within this limit, however, there has been a massive northward migration of corn and soybeans, and a reorientation of the corn-hog economy of the Middle West.<sup>4</sup>

The lesson to be learned from these observations is simple, yet profound. The forces now at work in American agriculture are retracting the extensive margins of agricultural land use. One result is a regrouping and concentration of land values. National data to illustrate this change are as yet incomplete, although the state and local data available leave little reason to question the direction of the trend.<sup>5</sup>

<sup>3</sup> The index of farm output (1947-49 = 100) stood at 113 in 1956, while the index of cropland used for crops had dropped to 98 (with a further drop to 95 forecast for 1957). See USDA, *Changes in Farm Production and Efficiency*, ARS 43-33 June 1956; USDA, *Major Uses of Land in the United States*, Agricultural Information Bulletin No. 168, January 1957; USDA-AMS, *Statistical Summary*, SS-176, July 18, 1957.

<sup>4</sup> See Andreas Grotewald, *Regional Changes in Corn Production in the United States from 1909 to 1949*, University of Chicago, Dept. of Geography, Research Paper No. 40, June 1955, pp. 41-49; Chauncy D. Harris, "Soviet Agricultural Resources Reappraised," *Journal of Farm Economics*, Vol. XXXVIII, No. 2, May 1956, p. 273; Philip M. Raup, "Agricultural Land: Changing Patterns in Its Use," *Minnesota's Tomorrow*, University of Minnesota, Social Science Research Center of the Graduate School, 1956, pp. 45-49.

<sup>5</sup> In Minnesota, for example, the "center of land values" for the state has moved southward in recent years. Except for 1920, the counties in Crop Reporting District 7, in the southwestern area of the state, accounted for an average of 13 to 15 per cent of total farm land values from 1900 to 1935; in 1954 they accounted for over 18 per cent. A parallel concentration has occurred in Iowa. Crop Reporting District 1, in the northwestern sector of the state, accounted for 12 to 14 per cent of the total land value of the state from 1900 to 1930; it accounted for 16.3 per cent of total value in 1954. In general in the Middle West southern Minnesota has gained relative to northern Minnesota, northern Iowa relative to southern Iowa, and northern Illinois relative to southern Illinois.

### III. The Influence of Urbanization

Another major complex of forces affecting competition for land results from the process of urbanization. This influence has been felt in two principal forms: (1) an expanded demand for surface area for urban expansion, industrial decentralization and the transport network, and (2) an increased investment and residential demand for rural land on the part of urban and nonfarm users. The spatial needs for urban land are the most readily apparent. Between 1945 and 1954 the annual increase in land area occupied by urban and transport uses has totaled approximately 831,000 acres per year. A total of 43.1 million acres were devoted to these uses in 1954, or an area approximately equivalent to 11.4 per cent of the total area of cropland used for crops in the United States in that year. To some extent this comparison is misleading, for not all of the land area devoted to urban and transport uses is suitable for crops. In most cases, however, our cities and highways compete directly with crops for the use of land.<sup>6</sup>

It is more difficult to secure reliable estimates of the demand for farm land on the part of nonfarm people seeking rural residences. The 831,000 acres per year cited above does not include areas devoted to rural non-farm residences beyond the boundaries of organized urban areas. There are no reliable acreage estimates of the magnitude of this shift of rural lands from agricultural to residential uses, but it has been marked in the past decade.<sup>7</sup>

From New England to Virginia, westward around the Great Lakes in a broad band extending north of the Ohio and west to Minnesota, and in Florida, California, and the Pacific Northwest this element in the demand structure for land has played a particularly prominent role. This aspect of our age is so widespread and so much a matter of common knowledge that a reference to it appears trite in a technical paper, yet its influence can hardly be overestimated. Some of the most important forces in modern American life, including the motor car, the desire for home ownership, the emphasis on informal "outdoor" living and our traditional

<sup>6</sup> U. S. Department of Agriculture, *Major Uses of Land in the United States*, Agricultural Information Bulletin No. 168, Washington, D.C., January 1957, pp. 26-27.

<sup>7</sup> One indication of the scale on which this shift has taken place is afforded by the following estimates showing part-time and residential farms as a per cent of the total number of farms for the census years 1929-1954:

1929	1939	1944	1949	1954
(per cent of total farms)				
14.9	19.8	23.7	31.0	31.5

See *Family Farms in a Changing Economy*, U. S. Department of Agriculture Information Bulletin No. 171, March 1957, p. 19. Percentages for 1929-1944 are based on total number of farms adjusted to conform with census definitions used in 1949 and 1954.

lavish use of space and mobility all combine to make this a major element in competition for land use.

The effect of this demand element on the pricing mechanism of the land market is demoralizing. Urban residents seeking rural housing sites are relatively uninterested in the agricultural value of the land. They are justified in bidding high prices for buildings, or for scenery, with little or no regard to the agricultural productivity of the accompanying land. Where this demand element comes in conflict with the demand for farm enlargement on the part of local farmers, the pricing mechanism of the market loses precision. Traditional bases of value are disturbed, assessment for taxation becomes haphazard, and good agricultural practices suffer. One of the characteristic features of rapid urban expansion is the belt of "urban desert" surrounding our major cities. Where ultimate residential use is anticipated, heavy agricultural investments in the land are unwarranted. When this condition prevails, the exhaustion of soil productivity becomes economic, agricultural land use planning is limited to a seasonal basis, and much land is simply idle, devoted to no use other than the "ripening" that is characteristic of transitional areas.

These trends are likely to continue. Urban and industrial expansion, and agricultural specialization, seem destined to follow a localized pattern, with their primary influence affecting those areas already experiencing the major impact.<sup>8</sup> The consequences for the land market, and for competition among land uses and users appear clearly: Technological change from within agriculture, and the forces of urban and industrial development from without, are focusing the demand for land upon certain favored areas. Extensive margins are retracting and competition for land within the "favored areas" grows keener.

#### IV. Inflationary Trends

The technological revolution in agriculture since 1940, together with the rapid progress of urbanization, have been associated with a major reversal of a long-term trend in the value of land relative to other factor and product prices. I have chosen to refer to this secular increase in relative land values as "inflation," although I am aware of the fact that there are value judgements implicit in this point of view. I shall try to make them clear.

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<sup>8</sup> This is the interpretation of recent trends drawn by Vernon W. Ruttan, who argues that "local urban industrial development will present an effective alternative to geographic labor mobility in only a few of the nation's low-income agricultural areas during the next two decades." See "The Potential in Rural Industrialization and Local Economic Development," (Mimeo), paper presented at the Conference on "Adjusting Commercial Agriculture to Economic Growth," North Central Farm Management Research Committee, Chicago, Illinois, The Farm Foundation, March 15, 1957.

The index of farm land prices compiled by the U. S. Department of Agriculture, 1947-49=100, rose from a level of 49 in 1940 to an estimated 147 in March of 1957, almost precisely a three-fold increase. The magnitude of this increase is better appreciated if we compare it with some other changes over the same period.

Between 1935-39 and 1956, the index of physical output per man hour in agriculture approximately doubled, rising from a level of 62 to 137 (1947-49=100).<sup>9</sup>

Between 1935-39 and 1955, the real net value of privately owned structures and equipment used in all manufacturing establishments rose from 40 billion to 64 billion of 1947 dollars, or an increase of 60 per cent.<sup>10</sup>

If we deflate the index of U. S. farmland prices with the index of consumer prices, the index of wholesale prices, or the index of farm prices, we obtain a consistent pattern; a secular downward trend in the deflated index of land values from 1910 to a low point in the 1941-43 period, followed by a marked upward movement in relative land prices in the past decade. These trends are shown in Chart 1.

Measured in terms of each of the standards of comparison cited above, the level of farmland values has exhibited a relative increase since the end of World War II. This is true in terms of consumer prices, wholesale prices, prices received by farmers, or in terms of net physical productivity per man hour. The rise in agricultural land values is particularly marked in contrast with the more modest increase in the value of fixed assets (structures and equipment) used in manufacturing.

The conclusion seems unmistakably clear. Farmland values in the United States in the past ten years have risen relative to other factor and product prices, and they have risen approximately 50 per cent faster than any parallel changes in the net physical productivity of labor in agriculture. It seems justified in this setting to speak of an inflation in farmland values.

The technological pressure for farm size enlargement has injected a new note into the demand for agricultural land in the past decade, through its influence on the value of farm buildings. The expansion in average farm size reduces the number of farmsteads needed. The effect is to spread the building component of land-and-building values over a larger number of acres. At the same time, where demand for land to add to existing farms is strong, a relatively low value is placed on attached buildings. Where an adjacent farm has been purchased to add to an existing unit, the second set of buildings has often been torn down.

<sup>9</sup> *Productivity, Prices and Incomes*, materials prepared for the Joint Economic Committee by the Committee Staff, 85th Congress, First Session, Joint Committee Print, Washington, D.C., Letter of Transmittal dated June 21, 1957, p. 89.

<sup>10</sup> *Ibid.*, p. 102.

## U.S. FARM LAND VALUES, 1910 - 1957 (1947-49=100)

deflated by

(A) Consumer Price Index 1947-49=100

(B) Wholesale Price Index "

(C) Prices Received by Farmers "

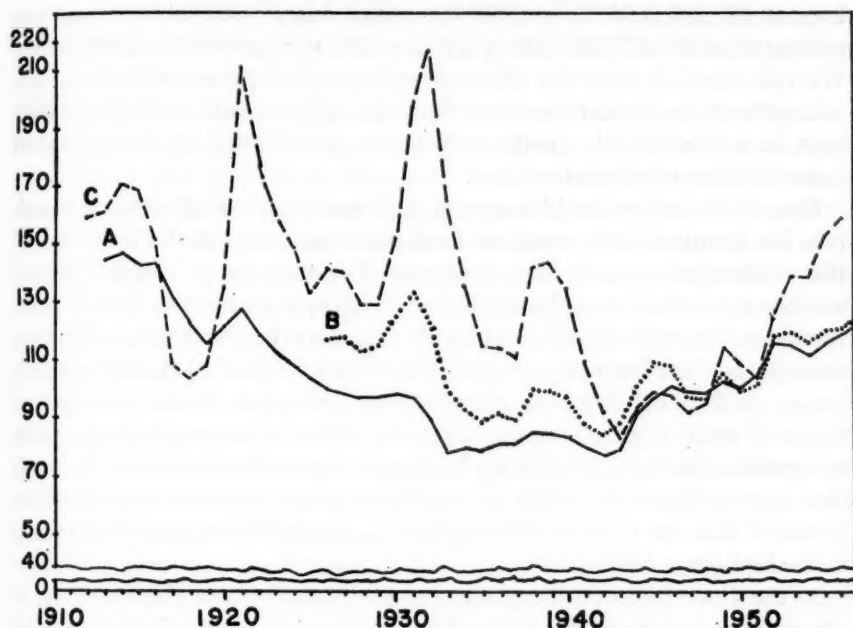


CHART 1

Alternatively, higher per acre prices have in some cases been paid for land of comparable quality with no buildings attached. The effect is to depreciate the value of buildings generally, as an adjunct to agricultural land.

The combined effect of these two forces, fewer farmsteads per thousand acres of land in farms and the action of the market in depreciating buildings, has been to reduce sharply the building fraction in total farmland and building values. From 1920 to 1940 the value of farm buildings as a fraction of the total value of farm real estate rose steadily, from 17 per cent to 31 per cent. Since 1940, the share of buildings in total farm real estate values has dropped sharply to an estimated 22.5 per cent of total farm real estate values in 1957, with the most rapid decrease occurring in the past five years.<sup>11</sup> Farm buildings in 1957 are a smaller fraction of the total value of land and buildings than at any time since

<sup>11</sup> U. S. Department of Agriculture, *Current Developments in the Farm Real Estate Market*, CD-44, July 1956, p. 11 and CD-46, May 1957, p. 15.



1925 and are only slightly above the percentage of value that they represented in 1900.

If we adjust for these confusing trends in the value of farm buildings, the rise in the value of the land alone is even more striking. The 1940 Census of Agriculture reported the global value of farmland, less buildings, at \$23,237,000,000; by 1957 the value of land without buildings was estimated at \$84,875,000,000 or a rise to 365 per cent of the 1940 level.<sup>12</sup> We can conclude that the effect of technological pressure for farm size enlargement has been to increase the value of farm land, excluding buildings, to a substantially greater extent than is indicated by the published indexes of farm real estate values.

One of the imponderables among the forces that are affecting competition for farmland and resultant land value increases is the influence of the various government farm programs. For some crops, notably wheat, acreage restrictions have been severe enough to force farmers to seek additional land in order to maintain family income and spread fixed costs over more acres. This has unquestionably led them to channel the full earning power of their existing farm units into the bid-price offered for adjacent tracts of land, if they become available. Where this condition prevails, competition for land has bid up land prices for individual tracts to levels that seem difficult to justify by anticipated long-run net earnings. Evidence of this can be found throughout the Great Plains, and particularly in the Red River Valley.

In the Corn Belt and dairy areas of the Middle West, the influence of government programs on competition for land has been less direct, although hardly less significant. To the extent that farm programs have increased the security of income expectations, they have encouraged farmers to invest more heavily in the direct costs of production. Fertilizers, chemical sprays, ready-mixed feeds, and better seeds are examples in point.<sup>13</sup> To the extent that this greater security of expectations has contributed to higher levels of capital input and greater efficiency in production, it has altered the comparative advantage among crops and products, in favor of those directly benefited by price support measures.

One consequence has been the capitalization of this enhanced comparative advantage into higher prices for land. Examples of this process are most easily found in the tobacco areas, and in milksheds protected by the system of federal milk marketing orders and regulations. Although

<sup>12</sup> *Ibid.*, CD-46, May 1957, pp. 13-15.

<sup>13</sup> Specific evidence in support of this judgement is not readily available. One of the exceptions is Minnesota Agricultural Experiment Station Technical Bulletin No. 211, *An Economic Analysis of the Impact of Government Programs on the Potato Industry of the United States*, by Roger W. Gray, Vernon L. Sorenson, and Willard W. Cochrane, June 1954, especially pp. 137-145.

less readily identified, the process has unquestionably taken place in wheat, cotton, corn and peanut producing areas, as well.

There can be little question that government programs have altered the pattern of competition among land uses. Whether or not this has subverted the goals of the programs is another matter. Much of the confusion on this score stems from a failure to distinguish between the income redistribution aspects of government programs, and their contribution to a greater security of income expectations.

If one goal of the programs is to secure immediate income redistribution then a capitalization of government program benefits into land values may defeat this goal. If another goal is to secure greater stability in a notoriously unstable enterprise, then this goal is undisturbed by a capitalization of benefits into land values. The present generation will reap windfall gains, just as the present generation has reaped windfall gains through the introduction of social security. The increased security of expectations will be of widespread good to the industry as a whole. Assume that the benefits of government programs have been capitalized into land values, and that the ownership of the land involved has passed to succeeding generations. They will have inherited or bought a capital asset of enhanced value, for they will have at least one of the major uncertainties reduced in magnitude to a point that will permit more rational production planning and family living.

Within the existing framework of the American economy the only measures that would prevent price stabilizing programs from being capitalized into land values would involve restrictions on land market transactions, confiscatory capital gains taxation, and a variety of similar devices. The magnitude of any distortions in patterns of farmland use traceable to government farm programs hardly seems great enough to justify this type of control. Some portion of the rise in farm land prices since 1940 is quite properly assignable to the influence of government farm programs in specific areas. I would rank this influence, however, as distinctly inferior to the processes of technological change and urbanization, as they influence competition for land.

#### *V. Comparisons with Western Europe*

Although historical analogues must be interpreted with care, we can gain some perspective on current trends in land use in the United States by a look at western Europe. Two of the trends cited above, urbanization and inflation, have long been a feature of European life. When coupled with a history of repeated wars, they have called forth institutional controls to insulate the farm land market from urban and investment demand.

Prominent among the rights in land that Western society reserves to the state are the powers of eminent domain, taxation, the police power, the "power of the purse," and the right of escheat. European experience in the past quarter century has seen the emergence of a newly reserved right that must be added to this list, the right to compel beneficial use.

There is a parallel in this respect with the modification in private property rights in water that occurred in the American West when north European concepts of common law riparian rights came in conflict with physical water shortages. A similar modification in real property rights in land has taken place in modern Europe, propelled by wartime threats of food scarcity, snowballing population densities, and inflation. The United Kingdom, Switzerland, Germany, Austria, Norway, Denmark and Sweden have all adopted legislation to compel landowners to devote their lands to beneficial use. In Switzerland, Germany, Austria, Norway, Denmark and Sweden this legislation is coupled with control mechanisms designed to prevent the purchase of land for speculative purposes or the investment buying of farms by persons who do not intend to operate them. In England, although investment buying is permitted, the demand for agricultural land for urban and industrial expansion has been subject to the elaborate mechanism of the Town and Country Planning Act. The origin of much of this legislation can be traced to war-born fears of food shortages, but many of these laws have been given their most developed form in post-World War II legislation.<sup>14</sup>

Although the motives underlying this legislation differ among countries one universal effect emerges clearly—the insulation of the rural farm land-market from the impact of urban and investment demand, in its several forms. In each of the countries concerned, two major motive forces have

<sup>14</sup> A partial list of references follows: For *Switzerland*, see Ernest Feder, "The Swiss Statute of 1940 on the Liquidation of Debts on Farms and the Swiss Statute of 1951 on the Preservation of Rural Properties," Brookings, South Dakota Agricultural Experiment Station, March 1952 (See especially Article 19 of the "Federal Statute on the Preservation of Rural Property and Farm Enterprises" of 12 June 1951). For *Sweden* see Law No. 272 (Acquisition of Land Act) of 3 June 1955 and Theodore Bergmann, *Wandlungen der landwirtschaftlichen Betriebsstruktur in Schweden*, Dissertation, Institut für Agrarpolitik und Ernährungswirtschaft an der Landwirtschaftlichen Hochschule, Hohenheim, Germany, February 1955. For *Germany* see Allied Control Council Law No. 45 of February 20, 1947 and subsequent enactments by the West German Laender. For *England*, the emergency wartime legislation embodying these powers was consolidated in the Agricultural Act of 1947. For *Norway* see the Act of 18 March 1955 concerning the formation of farm holdings, especially Chapter XIII, Sections 53 and 54. For *Denmark*, the relevant legislation is contained in the "Act regarding the parcelling out and extension, etc. of real estate," No. 290, March 31, 1949 and the "Act regarding farm property," No. 291, March 31, 1949. (English translations of the principal sections of several of the laws cited above are available through the annual volumes of *Food and Agricultural Legislation*, FAO, Rome, 1952 to date.)

been at work. On the one hand, reliance upon food imports to supplement domestic supplies has led to a concern for the food base. This motive is most clearly apparent in the wartime legislation of the United Kingdom, Switzerland, and Germany, where the immediate goal was to insure full agricultural use of available land resources. On the other hand, a second major motive force has been a desire to preserve a peasant form of agriculture. In its European setting, this approximates the American concern over the preservation of the family farm. Among continental European countries, this desire has been more sharply focused upon the goal of owner-operation, a goal that has been seriously threatened in modern times by the widespread appearance of monetary inflation.

The basic formula for survival in an inflation-torn economy is to transfer intangible wealth into tangible form. This can be seen in its most acute form in the effect of inflation on the demand for land. When inflation-crazed capital seeks to buy into agriculture, at almost any price, the mechanism of the land market breaks down. In the cruder forms of inflation that characterized Germany in 1923 and Hungary after World War II, trade in land ceases. In these crisis situations, the threat of inflation to the structure of agricultural land ownership is not great. The more pressing danger occurs under the conditions of suppressed inflation that have characterized most European countries since the outbreak of World War II. Where inflation is in a sub-acute stage, but remains a menace, the astute investor will make a persistent effort to convert his wealth into tangible goods and particularly into land.

This circumstance has characterized much of Europe in modern times and holds great interest for the United States today.

#### VI. *Some Possible Trends in American Development*

There seems little likelihood that a concern for the food supply could lead to an American effort to enact legislation to insulate the farm land market from urban demand, or to compel full use of the land. If we turn to the prospects of inflation, a different picture emerges. It is not difficult to find rural people who are concerned about the persistent tendency for investor buyers to increase their holdings of agricultural land. This tendency is most clearly apparent in the areas surrounding urban centers, in the highly productive areas of the Central Corn Belt, in the Central Valley of California, the Mississippi Delta, the Lower Rio Grande Valley, and in the vegetable and specialty crop area stretching from Florida to Maine along the Atlantic piedmont.

For the years since 1947-49, investor buyers have consistently accounted for approximately one-third or more of all farm land sales in the United States. These proportions have approached one-half of all farm



land sales in the Northeast and in the Pacific Coast states.<sup>15</sup> Although comprehensive data on farm land transfers within states are not generally available, fragmentary data suggest that these trends toward investor buying are concentrated in the more productive land areas.<sup>16</sup> Apart from inflationary forces, a powerful incentive is provided farm land buyers in higher income brackets by capital gains and inheritance and estate tax laws and practices. This motive force has two forms:

- a) Where a farm will absorb large capital inputs, it affords the wealthy buyer a valuable opportunity to convert annual income into capital gain. This is perhaps most clearly apparent in the case of ranch land in the western states. An investor buyer can acquire a farm or ranch, plow all profits into capital investment for as long as they will yield any net return to capital, and by selling or transferring the property through inheritance can convert what would otherwise have been annual income (taxable at his marginal income tax rate) into a long-term capital gain, of which not more than 25 per cent can be taken by taxes under existing federal income tax laws.<sup>17</sup>
- b) Appraisal practices for estate and inheritance tax purposes provide another incentive to the investor-owner. An estate of \$100,000 in negotiable securities and intangibles will typically be valued at current market prices as of date of death, throughout the United States. An estate in farm lands, having a current sale value of \$100,000, will rarely be appraised at current market price for purposes of inheritance and estate taxation.<sup>18</sup>

These considerations have undoubtedly played a role in the calculations on nonfarm bidders for farm lands. Although it is difficult to esti-

<sup>15</sup> U. S. Department of Agriculture, *Current Developments in the Farm Real Estate Market*, CD-44, July 1956, pp. 16-18.

<sup>16</sup> In Minnesota, for example, the percentage of total farm land sales made to investor buyers has consistently been highest in recent years in the southwestern counties, comprising the most valuable Corn Belt land in the state.

<sup>17</sup> One of the peculiarities of this process is that an investor owner, depending upon his marginal effective income tax rate, may find it profitable to invest well beyond the conventional point of diminishing marginal rates of return to capital, or to sell at a price that would represent outright loss to an owner with a more modest income.

<sup>18</sup> A glimpse into the operation of this process of systematic undervaluation of estates in farm land is provided by a sample of 304 farm estates collected from the records of the Minnesota Department of Taxation in 1955 (covering estates probated for the most part in 1953 and 1954). These data indicate that the estates located in 27 out of 35 southern Minnesota counties for which data were available were appraised for estate tax purposes at values substantially below the level of farm land values prevailing in these counties in 1954. In one-fourth of the counties the estates were appraised at more than 30 per cent below the 1954 county average value of improved farm lands.



mate their impact upon competition for land, it is only necessary to read the trade association literature of the real estate profession, or the income tax manuals developed by professional farm management advisors, to realize that these are important forces in the current demand structure for farm lands.<sup>19</sup>

The growth of these trends in the American economy may well present us with major policy decisions. Urban, industrial, and transport uses will probably continue to occupy larger areas of agriculturally used land. Of even greater importance, we can anticipate an increased use of land for rural residences and part-time farms. Our existing tax laws and levels of personal income, together with a long history of appreciation in land values seem likely to continue to attract nonfarm investor buyers to the farm land market.

The combined impact of these forces may well price farm lands in major agricultural areas at levels that are out of line with values that can be supported by net farm incomes. If these trends persist, the long-run effect will be to separate the ownership of landed capital in agriculture from the functions of farm operation.

To the extent that this results from capital gains and inheritance tax considerations, it amounts to a subsidy to nonfarm capital invested in rural lands. At this level, the policy decision may take the following form: Should we continue existing tax advantages that currently give some nonfarm bidders a competitive advantage in the land market? Alternatively, should steps be taken to make long-term land credit available to farmers at rates that contain an element of subsidy from the public purse?

At another level, the continuation of current trends could well lead to political pressure to establish more direct forms of control over the purchase of land by nonfarm buyers. Among the forces that could bring this about, the threat of persistent inflation stands out most prominently. Direct controls of this nature would be repugnant to many people, farmers included. It is significant, however, that the countries of western Europe that have taken this route include many of those that are generally regarded as the most successful democracies in Western society.

The arguments that have been advanced in this paper are suggestive

<sup>19</sup> A careful and intriguing account of the operation of these forces in Great Britain is given by Donald R. Denman, "The Paradox of Rural Land Investment in Britain," *Land Economics*, Vol. XXXII, No. 2, May 1956, pp. 109-117. Needless to add, the much higher rates of death duty in the United Kingdom sharpen the operation of these forces as they influence the investment demand for rural lands. Denman's data show a nominal rate of return of approximately 1 per cent on capital invested in a sample of British rural estates. In spite of this low rate of return the lower estate duty applied to estates in agricultural land (since 1947, 45 per cent of the normal rate of duty) makes this an attractive investment outlet to British industrial wealth.

rather than conclusive. In this setting, the most that can be hoped for is that this discussion will stimulate further research into the structural consequences of current trends in the competition for agricultural land.

#### DISCUSSION: ECONOMIC DEVELOPMENT AND COMPETITION FOR LAND USE IN THE UNITED STATES

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Since I did not have an opportunity to thoroughly review Dr. Raup's paper previous to this meeting, I must confine my remarks to a few general comments on my own ideas about economic development and competition for land use. While listening to him deliver his talk, however, my impression, as I anticipated, was that he has presented an excellent paper with which I am largely in agreement. It is my hope that my remarks will emphasize some of his more important points. Nevertheless, I extend to you my apology for not being able to direct my comments specifically to the contents of the paper. This is in no way the fault of Dr. Raup. He sent me a copy of his paper, but unforeseen circumstances surrounding my own time required that I prepare my remarks earlier.

During the last decade or so land utilization, as a segment of land economics, has not received the attention its importance justifies. In allocating our educational resources, we have neglected studies of how our lands are used for studies of how rights in land are acquired and held. This is not to say that I wish to de-emphasize tenure. Rather, I believe we need to expand our research to include more land utilization studies than have been forthcoming in recent years. This expansion should largely be directed toward a more fundamental examination of the economics of land utilization including studies of institutional restrictions that shift uses of land away from those that will maximize its net value product to society.

A most important effect of recent economic development on land utilization is the creation of a greater amount of competition among uses of land for the fixed acreage within our national boundaries. In the future, agriculture can expect greater competition for land resources from the nonagricultural uses, and within agriculture there will be greater competition for land between extensive and intensive uses. In most areas, significant changes have occurred in the acreage and number of farms absorbed by urban, industrial, and other nonagricultural developments. These shifts will continue at a greater tempo than in recent years. As population grows, we shall experience a greater demand for home sites, recreational

facilities, industrial and business locations, transportation avenues, and seats for service institutions. Furthermore, we can expect more land to be devoted to specific uses designed to stabilize and protect our water and soil resources, and these may not necessarily be shifts within agriculture. These increases in demand for land will not be confined to present nonagricultural lands or to those lands less adapted (physical productivity) to agriculture—in fact, much of it will occur in our better farming areas. In other words, the demand for land is going to become more elastic, land values and rents will rise, and it is going to be more difficult for some highly productive and some less productive lands to remain in agricultural production.

This is not to say that I fear a shortage of agricultural products. I am not a Malthusian enthusiast, nor do I subscribe to the "scare bandwagon" of some of our popular conservationists. The work of the committees which prepared *Agriculture's Capacity to Produce* (U.S.D.A. Agriculture Information Bulletin No. 88), showed that farm output could be increased 18 percent over that of 1951 in a 5-year period, largely through a more widespread adoption of recent innovations. And I believe scientists can continue to improve the efficiency of agricultural production. Yet, I am conscious of the fact that population experts predict that our population will approximately double in the next four decades—reaching 300 million by the year 2,000. Thus, on the basis of sheer numbers alone, assuming no change in the quantities of goods and services the individual demands our needs will increase nearly two-fold during this period. But, at best, we shall not have any more land than we have today except for what increased efficiency we can accomplish through continued scientific research. Land utilization problems will continue to demand our attention in the future, and they probably will be more acute because of the increased competition among the uses of land. As has been the case in the past, our welfare will depend on how well we substitute land for labor and capital wherever such a substitution is economically feasible.

An important characteristic of economic development is the disparate rates of growth in different regions. Since development is not uniform, its effects are uneven, and problems arise from the failure of some regions to experience relative growth equivalent to that of others. Apparently, the underlying cause is the rigidity of institutions and their power to inhibit progressive changes.

This characteristic of economic development has important effects on land utilization, and it definitely influences the competitive position of established land uses. Wooten and Anderson, in *Major Uses of Land in the United States* (U.S.D.A. Agricultural Information Bulletin No. 168),

have provided us with a good description of the differences in shifts in land use by regions. In the Northern Region, the 1954 acreage of cropland used for crops was slightly above the 1930 acreage and in the Western Region the acreage of cropland used for crops increased by 18 percent between the same years. In further contrast, the Southern Region had only 81 percent of its 1930 cropland acreage used for crops in 1954. Furthermore, there are significant differences within regions. Wooten and Anderson point out that "in the Northeast, a persistent decline—from 23 to 15 million acres—has been associated with expansion of urban, residential, recreational, and industrial uses and continued reversion of cropland to brush and forest." In the North Central states, however, the acreage of cropland used for crops reached a peak of 210 million acres for 1950-54. "In the South, the acreage of cropland used for crops reached a peak in the 1930's, but since that time a sharp decline has accompanied the lessened emphasis on production of cotton." Southern cotton farmers are finding it somewhat difficult to compete with newer western cotton lands. As a result, the acreage devoted to grassland pasture and grazing land in the South increased 20 percent between 1930 and 1954, while corresponding acreages for the North and West declined 6 percent in both regions.

These are but a few of the many disparate shifts in land use that take place during periods of rapid economic development. It is surprising how often this aspect of economic development is overlooked with a resulting failure to allocate sufficient resources to land utilization studies.

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## FOREIGN TRADE

Chairman: G. M. Beal, University of Maryland

### DEVELOPING FOREIGN MARKETS THROUGH LOCAL CURRENCY PROJECTS

GEORGE J. DIETZ\*

*American Farm Bureau Federation*

EVERYONE is familiar with the great need for our food in World War II. During the immediate postwar period and the Korean War, this need did not lessen. In fact, the additional burden of feeding a substantial portion of the former enemy was undertaken by the United States. Stimulated by this demand and government incentive programs, our farmers and ranchers expanded output to meet war and postwar requirements.

Largely as a result of Marshall aid, European agriculture was soon on its feet. Production in other areas also registered gains and it was not very long before expanded world output of food curtailed demand for our farm products. Exports dropped off sharply. Foreign countries were given incentives to rebuild their agricultural plants—as we held an umbrella over many world market prices through unrealistic farm price support programs. In some cases, uneconomic production, not based on the comparative advantage concept, was stimulated.

Morover, with the memory of the war's shortages still fresh in their minds, a number of countries made efforts towards greater self sufficiency in foodstuffs. Much of this production was and is uneconomic, but it was felt to be politically expedient.

From 1951, when United States farm product exports amounted to over \$4 billion, our exports steadily declined until in 1953 they reached a low of \$2.8 billion. Surpluses mounted and it was rather obvious that something drastic had to be done to rebuild our exports to a reasonable level.

We lost these markets principally because we were (1) facing a dollar-short world, (2) running into all sorts of import restrictions and bilateral agreements, and (3) not vigorously pursuing our export markets with quality merchandise at competitive prices.

At this point Public Law 480 (The Agricultural Trade, Development and Assistance Act of 1954) was introduced in Congress—supported by Farm Bureau—and enacted into law. Simply stated, Title I of this law enables the United States to sell to foreign buyers for local currency,

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thereby temporarily surmounting the "dollar-shortage" problem. One of the law's basic objectives is the permanent expansion of foreign markets. Section 104 (a) of Public Law 480 provides that a portion of the foreign currency accruing from surplus commodity sales under the act may be used "to help develop new markets for U. S. agricultural commodities on a mutually benefiting basis." Executive Order 10560, dated September 9, 1954, designates the U. S. Department of Agriculture as the agency to carry out this provision of the law. Today, I have undertaken to discuss in this paper foreign market development through local currency projects.

The phrase "develop new markets" is defined to include the retention or expansion of existing foreign markets for U. S. agricultural commodities, both raw and processed, as well as development of entirely new markets. Market development for a particular U. S. agricultural commodity may be either for that U. S. commodity directly or when it may be expected that U. S. exports will be benefited by a general increase in consumption of that commodity.

To date, some \$36 million have been earmarked for market development from the proceeds of our local currency sales. These funds are controlled by the Bureau of the Budget. Around 70 projects have been developed since the program was started. The United States has participated in 16 trade fairs. Agreements have been signed with 30 different trade organizations. The Foreign Agricultural Service FAS has contributed the equivalent of \$6.8 million in local currencies to support these projects which includes \$1.7 million for participation in trade fairs. The U. S. signatory trade groups, together with foreign groups cooperating with U. S. organizations in the work, have contributed an additional \$2.4 million. Therefore, a total of \$9.2 million of foreign market promotion activity has been undertaken although some of this is not yet in the operating stage. FAS has stated, "We believe considerable progress has been made in developing this program; we do not expect 100 percent success; however, indications of some positive results are already evident."

Administration of the market development program has raised a number of problems. Due to the nature of the law, FAS has not entered into market development contracts with individuals exporters. Any such contracts most certainly would be vulnerable to criticism. At the outset it was apparent that the general farm organizations were not prepared to enter into this field of activity on a large scale. FAS had to start somewhere and an effort was made to select representative private agricultural trade groups.

Moreover, outside of cotton and tobacco and perhaps some fruit promotional groups, there were relatively few commodity groups well

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qualified by experience to take on such projects. The fact of the matter is that intensive foreign market development was a relatively new endeavor for American agriculture.

Traditionally, the general pitch of U. S. agriculture has been, "produce for our own people, the residue we can push abroad." Little real consideration by our private trade has been given to working for permanent long-range markets for dollars. The Dutch, Danes, Canadians and numerous other countries have made the effort to develop programs and products. They make certain that only quality products tailored for special markets and uses are sent abroad. These countries of course, rely on export markets for their very existence. They have discouraged short-term, speculative export operations which have damaged our markets during the postwar period.

In reality, the Marshall Plan period of easy exports was a period when quality was not given much consideration by our people. Rancid lard, and wheat and soybeans heavily laced with foreign matter have not helped develop permanent markets for our products. I am happy to report some of these conditions have been straightened up by tightening export standards. There has been, however, a need to introduce our exporters to the possibilities of moving our surplus products to foreign outlets. There is also a need to develop new outlets. A highly developed Europe has some 200,000,000 potential customers for some of our new products. Per capita income is increasing. Europeans are coming off of bicycles into Volkswagens. The people are substituting refrigerators for old cold rooms or cellars. With these technological changes, there are new opportunities to move an important quantity of U. S. poultry, specialty meat products, fresh fruit, etc. With the gain in income, there is almost always a corresponding demand for protein foods, as well as for the so-called (by European standards) luxury foods. People can and will up-grade their diets. With quality products and merchandising techniques, there is a potential market in Europe. Supermarkets are being developed and some of our exports will fit directly into these operations. With livestock numbers up in this area there is also a great long-range potential for U. S. feed grains.

Vast untapped markets for our products are present in the underdeveloped countries. However, the problems in these areas are still more complex. Lack of exchange is the principal one. The problems of teaching a Japanese consumer that wheat is a good substitute for rice; of teaching the Siamese the value of milk; and of creating a demand for our ice cream mix in Colombia have to be solved.

Large Commodity Credit Corporation holdings focused the spotlight on export markets. Moreover, World War II separated our exporters from

foreign buyers. Direct contact between these groups is necessary if markets are to be built on a permanent, mutually advantageous basis. A constructive market development program was needed and FAS was in a position to help because of Section 104 (a) of P. L. 480. Many private associations and individual firms also recognized the possibility of increasing sales by expanding operations abroad. Most of them, however, have had to be taken by the hand and led to these markets. As I have indicated previously, it is surprising how little our people know about export possibilities. FAS has supplied substantial funds to facilitate projects and has received supplemental amounts from these associations. In some cases, the offer of FAS to make available these funds has caused the organization of new groups for the purpose of entering into market development contracts. Some of these at this stage of the game, appear to be little more than paper organizations.

In at least one case, the market development program has led to an effort to establish a check-off on sales in the domestic market for the purpose of obtaining private funds to supplement government money. This raises serious questions of domestic policy as commodity check-offs can be costly and harmful to the best long-time interests of farmers.

FAS is taking a calculated risk that a good percentage of these market development projects will pay off, but there is no assurance that inexperienced groups can make wise use of the market development funds. The criticism has been made that some of the programs have merely been junkets for commodity organizations who have no "order books."

The market development program probably has the best chance of succeeding where a U. S. group has an opportunity to work with a foreign group that has a financial interest in the success of efforts to promote the sale of U. S. products and is capable of carrying on similar work after P. L. 480 has been terminated. Cotton provides a good example, since many foreign textile manufacturers have a financial interest in cotton's ability to compete with synthetic fibers.

This means that the trade and the government should seek the cooperation of foreign groups. Cooperating groups should be asked to assume a part of the cost at an early stage of the project. For example, German poultry producers should cooperate with U. S. poultry exporters to stimulate German interest in and consumption of poultry products. Very often these domestic groups have fought off foreign imports as being detrimental and endangering their industry. Actually, there is no reason why the German poultry farmer cannot benefit by the introduction of quality U. S. poultry—if the imports help to expand permanently the *total* market for poultry products.

If properly carried out, market development projects can (1) develop

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useful information on the requirements and possibilities of foreign markets, (2) increase foreign understanding of U. S. grades, standards, and marketing procedures, and (3) focus attention on the barriers to increased trade. Our government and the trade must understand that market development, whether domestic or foreign in nature, is not a panacea. *When market development stimulates an uneconomic or artificial demand that will not or cannot be sustained on a long-term basis, or when it stimulates uneconomic production in our country, it is not serving the best interests of agriculture.*

### *Trade Fairs*

Many people throughout the world have had their first opportunity to see, taste, and feel U. S. products at international trade fairs. Participation in the fairs offers the United States an excellent opportunity to acquaint potential customers abroad with the availability, quality, and uses of U. S. agricultural commodities. International trade fairs are a major means by which trades people in many foreign countries do business. Most of the fairs are open to the general public, but their chief purpose is to bring together buyers and sellers from many parts of the world.

In organizing its trade promotion exhibits at trade fairs, the Foreign Agricultural Service works with private agricultural trade groups and with other government agencies—chiefly the U. S. Department of Commerce and the U. S. Information Agency. In general, the industry concerned provides exhibit ideas, technical personnel, display materials, and, in some cases, commodities for sampling. The Foreign Agricultural Service organizes and manages the exhibit; arranges for its design, construction, and operation; and pays the travel expenses of industry technicians and commodity specialists participating in the joint effort. It also organizes and arranges for special trade promotion activities in connection with the exhibit.

### *Market Development Surveys*

The following examples of surveys indicate the broad scope of activities undertaken by the government in cooperation with U. S. industry. These surveys can help to determine what potential markets exist and to increase foreign understanding of U. S. grades, standards and marketing procedures.

For example, two University of Kentucky agricultural economists, in cooperation with the U. S. tobacco trade and the Spanish Tobacco Monopoly, studied Spain's tobacco market. Preliminary findings indicate that the Spanish prefer cigarettes made from U. S. leaf. Further, more

American-type cigarettes at competitive prices would increase sales, the Spanish government would gain more tax revenue, and imports of U. S. tobacco would expand. Another survey, made by a three-man team representing the U. S. dairy industry, found that Colombia offered market possibilities for milk and dairy products.

Exchange visits by market specialists and key businessmen are also proving successful. Twelve of the projects were devoted entirely to this method of acquainting foreign buyers with our products. Two representatives of the National Renderers' Association went to Japan to boost sales of U. S. inedible animal fats. They found the Japanese had complaints about quantity and quality of shipments. Some of the difficulty was caused by their not understanding the U. S. methods of measurement and testing. But some of it was our fault, too; the quality was not uniform. In Japan, U. S. tallow representatives showed importers U. S. methods. In this country they talked with producers and shippers and showed them through slides and pictures what was wrong. Both sides cooperated to iron out these problems—and Japanese acceptance of our tallow improved.

Another example is that of a group of Italian wheat specialists who visited our Middle West; afterwards, favorable articles appeared in Italian trade papers on the commercial use of U. S. hard red winter wheat for pasta.<sup>1</sup>

The idea of market promotion is good—but the idea of doing market promotion work in the foreign field is new. It is doubtful that we now know exactly how it should be done. There are limitations on the ability of the government to carry out such programs, even when the government works through private groups.

There was, and still is, a need for caution to avoid procedures that tend to create a monopolistic situation either in the U. S. or in the countries where the projects are undertaken. Every safeguard should be maintained to assure that market development funds are not manipulated so as to be used to the exclusive advantage of the official contracting trade group. It is imperative that normal marketing channels be utilized wherever and whenever possible. We need to find some way to stimulate more promotion in the foreign field by companies that have the "order books." P. L. 480 is a temporary measure. At best, all it can be is a catalyst on an interim basis.

American agriculture must never forget that its primary task in the export field is to develop dollar markets for its products on a permanent basis. In the long run, the share of the international market held by U. S. farm products is largely dependent upon the over-all foreign economic

<sup>1</sup> Based on USDA publication.

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policy of the United States. This includes United States policy with respect to trade, tariffs, restrictions, foreign investment, economic development, stockpiling of basic materials, off-shore procurement, and other factors. *The importance of our maintaining a properly administered reciprocal trade agreements program should not be underestimated.*

### U. S. Agricultural Trade Center

Farm organizations and private industry are now taking one concrete step to develop markets under their own steam without use of government funds. A recommendation to explore the possibilities of a trade center at Rotterdam, the Netherlands, came from a meeting June 13 of the Foreign Market Development Committee—a group made up of representatives of several of the principal organizations in the U. S. having an interest in expanding foreign trade. Chairman of the committee is Homer Brinkley, executive vice president of the National Council of Farmer Cooperatives. The American Farm Bureau Federation is now preparing a comprehensive report on the feasibility of establishing the trade center. This report will be released in the near future. The question of whether such a center is to be established will depend primarily upon whether private firms, trade associations, exporting interests and others concerned are prepared to financially underwrite the proposed project.

Europe is by far the largest commercial market for U. S. farm products. As its economy continues to improve, we shall have an opportunity to compete for an even larger market. During the next 10 or 15 years, facing up to the common market arrangement, every effort must be made by American agriculture to maintain (and, we hope, to expand) this market. Some of the marketing problems we have encountered and will continue to encounter cross national boundaries. In addition, many American agricultural products are handled by foreign agents and brokers who also represent our competitors. The best way to hold the European market and to develop new markets for U. S. agricultural products in an expanding European market is to put our products on display and *to make them easy for people to buy without unnecessary delays.*

In order to help in meeting European-wide marketing problems and to promote acceptance of American farm products, U. S. farm organizations, individual entrepreneurs and trade associations should seriously consider establishing a U. S. Agricultural Trade Center at a central European point. If such a center is to be established, Rotterdam, the world's third largest port, is a logical location.

The following is a brief description of the proposal:

The center would stimulate the sale of U. S. farm products through promotional activities which supplement efforts of the U. S. trade and

the Department of Agriculture. Emphasis would be placed on new products for which consumer acceptance has not been established and on established trade products where promotional efforts give greatest promise of increasing trade. *During the past two years over 40 percent of U. S. farm product exports moved under direct government programs, such as sales for foreign currency and barter. When export sales made possible by export subsidy programs are included the total approximates 70 percent.* These data are alarming. This year more than \$2 billion worth of U. S. farm products will be exported to the European area. During the coming years the United States will have to work to maintain this level.

*Value of U. S. Farm Products Going to Europe in 1956*

Grain and Feed .....	\$ 670,000,000
Cotton and Linters .....	400,000,000
Fats and Oils	
Oil Seeds .....	377,000,000
Tobacco .....	240,000,000
Fruits, Nuts and Vegetables .....	150,000,000
Animal Products .....	120,000,000
Others .....	49,000,000

Total European .....\$2,006,000,000

Total Farm Exports .....\$4,158,000,000

Percentage European/Total ..... 48%

Source: USDA

**The U. S. Agricultural Trade Center could:**

1. Maintain continuous supplies of samples of new products, including products offered for export by the Commodity Credit Corporation—products to be available for distribution to interested buyers. Dutch authorities have assured us that there would be a minimum of delay regarding custom procedures for material used in the center. Special commodity promotion weeks sponsored by the U. S. trade would be valuable. There is a distinct possibility that the FAS and the CCC would station personnel at the center. They would maintain contact with the USDA by a direct Telex line.

2. Maintain current samples of U. S. grades of farm products and up-to-date information on inspection procedures and standards.

3. Maintain for distribution lists of U. S. exporters by product and lists of European importers. A small library and files might be developed.

4. Provide meeting space for discussion of European-wide marketing problems, such as need for changes in U. S. grades and standards to improve quality of exports or an explanation of changes designed to accomplish this objective—discussion by CCC official of CCC export policy (such as a new cotton policy or tightening of the wheat grade standards).

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5. Provide facilities for the preparation of promotional kits for use on a European-wide basis. Much of the equipment used in trade fairs could be used temporarily and rotated at the center. The USDA might station several mobile display units at the center. These units would travel throughout the continent.

6. Provide a listening post for the gathering of trade intelligence and trade opportunities.

7. Arrange tests to demonstrate the quality and acceptability of U. S. farm products, such as the use of U. S. wheat varieties in making bakery products, new uses for soybeans, etc.

*If the U. S. agricultural industry is going to get the government out of international trade in agricultural commodities, such a center might be a constructive step as it would bring the people with the "order books"—the representatives of U. S. and foreign private industry—together on a day-to-day working basis.* There are also possibilities for agricultural trade centers in Latin America and in the Far East.

The center would put a spotlight and a premium on quality merchandise. The export broker who is only interested in short-term sales and who has pushed shoddy U. S. farm products into markets during the post-war period would not benefit by the arrangement. The agricultural trade center should encourage permanent business arrangements for quality U. S. products by reliable exporters.

#### DISCUSSION: DEVELOPING FOREIGN MARKETS THROUGH LOCAL CURRENCY PROJECTS

GORDON O. FRASER

*Foreign Agricultural Service, USDA*

Dietz has followed closely the foreign currency market development program since its beginning and his excellent paper reflects his intimate knowledge of the operations to date as well as an understanding of the problems involved. There is very little in his paper with which we in the Foreign Agricultural Service might quarrel and in fact many of the points he has mentioned are among the policies we follow in carrying out this program.

In the Department we view this program as one providing our farmers with the opportunity of making certain that their export markets are being protected and developed. Perhaps more important is that the program provides a means whereby our farmers can make sure that their products are being properly promoted and marketed abroad—in other words, an opportunity to exercise surveillance over the export market

machinery. It is also, we think, a step in the direction of reducing the role of government in agricultural exports.

Dietz has mentioned the Dutch, Danes, Canadians and others have made the effort to develop foreign markets for their agricultural exports. It is noteworthy that the stimulus and drive behind these efforts in each of these countries comes from their farmers and farm organizations. Resort to the type of governmental or quasi-governmental institutions some of these countries use to handle and foster their exports, would not be desirable for the United States. But our farmers, by taking an active interest in the export market, can and should bring about modifications in our commercial export machinery where existing practices are such as to endanger the demand for our products. Dietz has mentioned a number of things that have already been done in this direction.

FAS is actively cooperating with some 30 producer and trade organizations in this program. We endeavor in each commodity field to select as our cooperator the organization most representative of the producer interest. Because of the lack of active interest by many producer groups in foreign marketing in the past there are a few instances where the organization we are working with may not be the ideal one, but we would, however, challenge the statement that some of the cooperating groups are little more than "paper organizations." To the best of our knowledge all of the groups with which we have contracted have real substance.

Dietz has mentioned that a calculated risk is being taken that a good percentage of the market development projects will pay off and that there is no assurance that inexperienced groups can make wise use of these market development funds. He is right, but if there were no risk in this field there would be no need for the program. We believe that the procedures followed in all our projects are such as to provide a good deal of protection against unwise use of funds.

When there is sufficient evidence that a market development opportunity for a given commodity exists in a country a survey team usually visits the country to determine if the opportunity is real, to develop contacts with local groups and if active promotion is warranted to explore the activities that should be undertaken. We have been pleasantly surprised by the caliber of people the producer and trade groups have been able to provide for these surveys. If, as Dietz indicated, there has been criticism that some of these surveys have been merely "junkets" for organizations with no order books, we are inclined to think the objectives of the team trips in question have not been understood nor have the results obtained been examined.

We view the role of FAS in this program as that of a catalyst. We

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have believed it to be essential that the government stay out of direct participation in promotional work insofar as possible. Therefore, practically all specific foreign market development work using local currencies is being done on contract with appropriate producer and trade groups. Even in the trade fairs the governments' role is primarily one of providing the showcase for cooperating private organizations. We insist that these organizations make a substantial financial contribution. Also it is expected that the U. S. cooperator will contract with an interested group or groups in the foreign country and that these organizations will in turn be required to make a substantial financial contribution. For example, the Cotton Council has been successful in obtaining contributions from cotton textile groups in Japan, Italy, Germany, Belgium, France, the Netherlands and Switzerland that match the FAS and Cotton Council contributions. It is reasonable to expect that those who put up funds will insist that they are not rashly used.

Proposed projects are also thoroughly checked with our embassies and agricultural attaches in each country to make certain that there is no objection on the part of the local government and no conflict with our foreign policy objectives. Finally, our attache maintains a continuing watch over active projects and he is assisted in this by periodic visits from FAS commodity marketing specialists. Where projects show signs of not being productive, they will be modified or cancelled.

We do not and should not expect spectacular and immediate results from the foreign currency market development programs. In fact, such results could conceivably backfire. We are after a long-range steady expansion of demand for U. S. agricultural products. This will not be quickly achieved, except in isolated instances. There must be an understanding and acceptance of this fact by the U. S. commodity organizations venturing into this field. Unless they are willing to assume a growing share of the cost and firmly commit themselves to staying with the effort there is then a real chance of waste. We have continually emphasized this point and at least one major commodity organization is already taking positive steps to be in a position 2 or 3 years from now to operate their program entirely with their own resources without dependence on government held foreign currencies. We hope more groups will follow this lead.

We are a long way from taking full advantage of the commercial export market opportunities that now exist for the products of American farms. The use of foreign currencies, for foreign market development to help close this gap is not, of course, all that is being done. It is, however, an important part of the over-all effort to develop larger and growing foreign markets and we believe it can contribute to the solution of our larger agricultural problem.



## THE ROLE OF THE AGRICULTURAL ATTACHÉ IN PROMOTING FOREIGN TRADE

ROBERT C. TETRO  
*Foreign Agricultural Service*

**B**EFORE describing in detail the "role" of the attaché, I believe I should warn you that we are dealing with administrative theory. We face differences of opinion and we are talking about new facets of old jewels. Franklin and Jefferson could be considered our earliest reporters in an overseas service to United States agriculture that has brought enough technology from abroad to leave by far the majority of our present farm products dependent on a foreign heritage. This service to agriculture became a part of the unified Foreign Service under our State Department in 1939. It came back to USDA in 1954, and its new facet is marketing. This is a function forced upon us partly by the complex trade problems resulting from our nearly 40-year-old shift to a creditor status among nations, a shift disproportionately revealed in large surpluses of farm products.

From a longer point of view, we are interested in what caused our shift to a creditor status among nations and what the future holds. I am sure you are familiar with the literature in this field, which usually refers both to our technological advancement and to the combination of natural resources that are so favorable to production. In agriculture, our technological progress will continue, although our advantage may be reduced as other areas of the world start catching up. Even so North America is likely to continue as a basic supplier of a substantial part of the world's international trade in agricultural products.

Nothing in the near future would indicate the need for less attention to foreign marketing of our agricultural products. The use of the adjective "foreign" is somewhat awkward because the principles of marketing, used domestically, are fully applicable overseas. Obviously, the process is more complicated owing to differences created by national boundaries. But the extent to which we fail to use the same techniques abroad is not fully explained by either the complications or by the number of governmental and private intermediaries between the farmer and his foreign consumer. Within this complexity, we already know some of our weaknesses. It would be useful, for example, if we could make further improvements in the overseas attitude toward our agricultural products. We need better established consumer preferences, based on assurances that we will be a continuous supplier of high-quality products, efficiently produced and traded. Advertising slogans of commercial life would be helpful, and

much is to be done by service to our customers sufficiently good to be classified in itself as institutional advertising. Some of our manufacturing industries are doing this better than agriculture.

### *The Attaché in His Setting*

The attaché is a part, but still only a part, of the vast private and public machinery that succeeded last fiscal year in moving \$4.7 billion of our farm products in overseas markets. How long such volumes will be available for export is a question better answered by you than by me. I am convinced, however, that whatever the volume, the need for attaches to service American agriculture and the American public will continue.

The Foreign Agricultural Service depends on the attachés to report events and situations in foreign countries. In addition to its current news value, this information is one of the essential bases for the formulation of policies for American agriculture. Thus, our current concept of reserving, or setting aside some part of our production carries with it the necessity of estimating when, how, and how fast those reserves can or should be drawn upon. Agricultural attachés are also the agents abroad of FAS and of American agriculture. As such, they have the chief responsibility in their assigned countries for promoting the interests of American agriculture. Without successful representation, other efforts are either hampered or made impossible.

The Foreign Agricultural Service and the agricultural attachés have always been concerned with discovering and reporting opportunities for the sale of agricultural products abroad, with removing governmental obstacles to trade, and with helping businessmen to make contacts and sales abroad. FAS, particularly through the attachés, has also always had the function of discovering, appraising, and reporting on the competitive situation in foreign markets for United States agricultural products. These activities have recently been expanded, with particular emphasis on market development, following the enactment of Public Law 480 (the "Agricultural Trade Development Act"). Under this Act, FAS has had the primary responsibility for selling surplus United States Agricultural products for foreign currencies and for developing programs that use part of the proceeds of such sales to build new foreign markets, or expand old ones, for farm products of the United States.

### *Role of the Attaché in Market Development*

Reporting is basic to market development. Without an understanding of the import needs of the country and the general economic situation which these needs reflect, no effective program can be devised for selling or developing markets for United States farm products. Reporting and

the thinking and effort that go into it are basic to the overseas and Washington job. It is the stuff of which FAS is made. A definition of reporting was given by Administrator Garnett when he said, "Report all significant developments affecting the production, use, and trade in farm products." Another term for this fundamental activity is "agricultural intelligence." When, by his travel, his study, his contacts, the attaché is able to do a good job of reporting, he is then able to perform effectively other tasks before him. The complete job of reporting goes beyond the figures in elementary tables. The meaning of those figures, particularly where year-to-year changes are substantial, are more important than the figures themselves. From the figures and their meaning come "the significant developments" that tell us whether our competition is increasing, a new market is opening up, or new barriers are being created against the movement of our products. Continuous good analytical reporting is like putting money in the bank, the more we have the easier it is to get more and the better able we are to do other things. Attachés must give primary consideration to the reporting function. This is true whether at a small post where he does most of the work himself, or at a large post where he directs and supervises reporting activity. From our present group of attachés, FAS receives each year more than 1,000 regularly scheduled reports and about 3,000 of what we call voluntary reports. This volume is supplemented in Washington agricultural analyses by a substantially greater volume of reporting produced by the economic outposts of State, other federal departments, and a number of other private and official organizations. All this reporting has a substantial bearing on overseas marketing.

What is a regular report? It is one of a number of reports received from overseas aimed to fit into regularly scheduled official publications on foreign crops and markets. In content, it combines the function served by our crop reports, situation reports, and to a lesser extent, economic studies of the Department of Agriculture. As in the crop report, it will be concerned with acreages, numbers, yields, production and condition. As in situation reports, it will cover factors affecting the demand for and market movement of farm products. These regular reports must cover official or unofficial action affecting trade, finance, levels of consumption and similar factors in economic analysis. The attaché reports do not require complicated techniques or skills, but they do require a substantial knowledge of agriculture and training in economics. Most of the more involved analyses or exercises on these data received from overseas are performed by stateside specialists.

When time permits, attachés are encouraged to prepare descriptive background reports for the various segments of the agricultural economy.

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Unfortunately, in recent years, time has not permitted very much of this. As a result, a critical review of the bases against which changes are measured is needed in many areas important to our global picture. For example, in Italy little has been done in this area of work since Asher Hobson's excellent reports of the Twenties.

The voluntary report discharges the attaches' responsibility for what we call our "Alert List." This usually means that the attaché must immediately report, often by cable, any substantial change in the conditions described to us in his last regular report. This, of course, covers the effect of things like drought, freeze, flood, pest or disease outbreaks and any government action substantially changing the outlook for farm commodities.

When one realizes that the attaché is responsible for describing the production of, or market for, a wide range of agricultural commodities, one can see that reporting under the best of circumstances is a difficult and full-time job, even though intensive analyses are not involved. Unfortunately, only a handful of the countries in which we have agricultural representation are blest with the "best of circumstances." These are the countries that have a fairly adequate corps of trained specialists who prepare current reports roughly comparable to those of the USDA. In other countries of the world, the situation ranges downward to a point where attempts to obtain information can only be made against the threat of criminal processes for the contributors and diplomatic action against the attaché. The latter threat is not too common. We have our greatest difficulty in obtaining reasonably accurate information in those countries with poorly developed services or techniques for crop estimating or other economic reporting; or where statistics are either not available or only become available at times too late for their most effective use. The attaché must be a reasonably good estimator of crops and markets with enough judgment to avoid going off the deep end when extreme situations occur.

The difficulties briefly described in the preceding paragraph make it even more important that the attaché discharge his representation function in a manner that will give him the widest possible range of information sources. These sources are needed not only for the checks necessary to reach reasonably accurate estimates, but also so that he may get quick answers to the frequent emergency requests for information necessary to support stateside analyses or negotiations.

The two important derivatives of the reporting process are *import needs* and *export prospects*. The first of these offers an opportunity for market development. The second gives us a measure of probable competition. In both cases, there are a number of other factors on which the



attaché is expected to be competent. The levels of consumption in some countries offer a tremendous market for our farm products, but the absence of ability to pay or of a willingness of governments to permit our imports can substantially alter this prospect. Another factor affecting both internal consumption and export prospects would be the adequacy of facilities for storing and moving the quantities produced.

### *Market Development*

A major purpose of our current FAS effort is market development. Market development implies that there is in each country a static import requirement from which we can build. I wish this were so, but a casual examination of the changes from year to year show significant differences by quantity, value and destination. Thus, maintaining and expanding overseas outlets for our products offers a tremendous challenge to agriculture and places a heavy responsibility on the attaché. This part of the attaché job is still in the formative stage. We would welcome any suggestions for improvements. Particularly, would we welcome any fool-proof techniques for the early recognition of commercial market opportunities. Today, government and business are in partnership to move our excess stocks and promote commercial movement of our farm commodities. A basic aim of USDA is the steady increase in the private responsibility for this movement.

Reporting is important to the attaché role in market development. Yet, in reporting, I cannot recall the use of intricate devices for calling the shots on market opportunities. Four-curve analyses, input-output studies, linear programming, indifference curves, matrix solutions, and similar techniques are rarely used. Personally, I don't think the raw data available in most countries would make such efforts very rewarding. More important, at present, is the common-sense observation of a number of rough indicators, a function the attaché can and does perform.

*Prices.* Although one may not be happy about the comparability of price information among countries, one can still draw some useful deductions from price studies. Are price levels substantially above world levels? If so, why? (At this point, beware the use of full employment concepts in a country where labor is substantially under-employed. Or assess the degree of political management and downright finagling where free enterprise is largely confined to textbooks.) Are prices of some commodities significantly disproportionate to any reasonable cost structure? How temporary is such distortion? Do the prices of any commodity have an unusually pronounced seasonal variation? If so, what proportion of the supply is firmly held? These are kinds of questions that attachés can answer sufficiently well to point up some market opportunities, or perhaps to define a field in which they can ask Washington for some special assistance.

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*Other marketing data.* What degree of autonomy is held economically or politically by sub-units of the country? What handicaps face competitive pricing? How many middlemen are economically or politically layered into the process? What taxes, Federal and local, must be absorbed? What cultural factors such as religious customs may be encountered?

*Per capita data.* In many countries, precise estimates on a per capita basis are almost impossible to obtain. However, a knowledge of such figures is useful to the attaché, as a measure of levels of living. They also bear some scrutiny. If carbohydrate or protein levels are low in an underdeveloped country, can commercial markets be developed? Over what period of time? Where levels of income are improving, what are the income elasticities for cotton, dried milk, other protective foods?

*Production.* Supply is always an important factor in calculating import needs and export availabilities. With this tautology out of the way, what are the trends in total farm production? How do they relate to population changes? To price changes? What are the prospects from new lands? New techniques? What proportion of production moves in commercial channels? What is the holding power of the farmer? Of internal and terminal markets?

*Policy.* Public documents on policy are difficult to produce and often must be highly classified. However, the answers to questions such as those above surely must be qualified in any array of market possibilities by the national policies affecting production and trade. Will a national deficit of 100,000 tons of wheat result in an outside purchase? Probably not in India? Probably so in the United Kingdom or in Ceylon? Has a newly born nation made political promises of more or cheaper food that require imports to fulfil? In such cases, will the supply come from a hard or soft currency area? Or another line, is a deficit going to be overcome by a policy of self-sufficiency? Or by the thumbscrew of inflation? Are deficits an item for open bidding, or will they be negotiated away in known or hidden bilaterals?

The above questions are enough to indicate the kinds of problems facing the attaché when he takes pen in hand to draft one of his many reports. They also show how reporting can fit into market development. But, they are only a beginning in the attaché role in promoting foreign trade.

### *The Attaché's Visitors*

On the basis of his own analysis, we said the attaché could request specialist assistance. This he does and we have available, for approved requests, commodity marketing specialists and economic analysts who can be sent to help on a wide variety of overseas problems. This type of teamwork is more rare than the assistance the attaché is expected to

render to specialists, analysts, students, tradespeople, and others who arrive at a post on ad hoc and often unannounced bases. Market analysts and project leaders under market development will be provided the professional assistance of the attaché office, insofar as necessary and available. In addition, there are many day-to-day services that make the post useful. These include office space and the provision of secretarial assistance and similar housekeeping backstopping. For longer investigations or negotiations, the attaché will have a list of interpreters, translators, and other elements necessary to a temporary office which the visitor can hire. More important, however, is the introduction of the visitor to the attaché contacts. This is often reciprocal because marketing specialists may have their own contacts not previously known particularly to attachés fairly new to a post. Some service is given to all visitors, whether they be tradespeople or travelers with only a casual interest in agriculture.

There are limits in the extent to which the attaché can assist businessmen who are seriously out to "do business." We have said that the attaché must alert stateside users on the possibility for the movement of a product in the country to which he is accredited. Sometimes he may be able to do this quite precisely, because the country has requested or is about to request bids. The attaché, at this point, may also give a prospective supplier a thorough briefing on the market and the possibilities of sale, but he must always stop short of accepting any responsibility for contract details. These are the unique responsibilities of the supplier and buyer.

There is a reverse of the above situations which is very important to the attaché, the Embassy and the United States. These are office visits by citizens of the foreign country requesting assistance, either on an import or an export item. In addition to the above complications this requires a substantial knowledge of our quarantine regulations, trade practices, commodity peculiarities, and many other details. There may also be the added diplomatic difficulty of politely providing service sufficiently adequate to satisfy the foreign visitor and yet not violating any of the written or unwritten regulations involved in our commerce in farm products. Careful attention to the foreign visitor will be amply repaid in useful contacts both for reporting and market development.

In developing contacts and servicing foreign businessmen, the attaché will often be asked to veer in the direction of technical assistance. However, he has no administrative responsibility for Point IV operations; both at a post and during his travel any technical assistance that he provides, or undertakes to provide, is usually only the type of courtesy that assists him in maintaining contacts. This is best illustrated by the numerous USDA and State Department publications that are invaluable to the attaché in maintaining his technical contacts. In this sense, he is literally

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a center for a wide range of information on agricultural production and trade.

The attaché must also pay attention to complaints on quality and specifications, particularly on United States products, but there are limits to this type of service, also. Briefly, the attaché can investigate and report as fully as possible any complaint coming to his attention. He should not, however, undertake to make any qualitative observation that might involve him in legal proceedings, in which he has no direct responsibility and from which he can only expect to receive trouble.

A considerable amount of the attaché's time will also be spent in servicing certain aspects of the more formal programs under market development. He will use his own skills, in association with those of other members of the embassy family, to aid in deciding the economic and political advisability of certain feature programs. These include government-to-government agreements for use of agricultural products, participation in trade fairs, special exhibits, distribution of samples, visits of "cotton maids" and "dairy princesses," and similar undertakings which can be very useful aspects of market development. Decisions also have to be made on technicians' schools, marketing services, advertising, and use of visual media.

In all of these, regardless of his original recommendations and views on feasibility, once an activity is under way, the attaché and his office will again undertake a substantial amount of service and occasionally active participation. Occasionally, Washington and the ambassador will give the attaché a leading role in such negotiations. His analyses will be important and when the discussions reach the "brass tacks" stage, he must often dig out details or more recent data to help get over the rough spots. Once any of these undertakings is in motion, he may play the mother hen. As one visitor puts it, "He's like the veteran character actor that always has a part regardless of the play or the stars." He supplies the data for negotiation, covers the foreign currency tip at the airport, finds you the emergency paregoric and bismuth, gets the doctor in the middle of the night, handles the special friend that arrived a day late or that it wasn't convenient to see. To many project enterprises, he is the friend at port and at court.

### *Conclusion*

I have tried, in the preceding statement, to indicate that the attaché's role in market development is extremely important. It will, of course, vary according to the problems of the country to which he is assigned and also with the skills and capacities of attachés and attaché offices. In conclusion, I would like to point out, perhaps the most important

feature of his role: that under ordinary circumstances, he is the only permanent representative of the Department of Agriculture, who is stationed abroad, with the sole purpose of doing everything he can to promote United States agriculture. He is "over there." Without exception, he also is often overworked. But, for one of the smaller units of our Foreign Service, I believe we have a group overseas of which our country can be justly proud.

#### DISCUSSION: THE ROLE OF THE AGRICULTURAL ATTACHÉ IN PROMOTING FOREIGN TRADE

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Tetro's paper is both revealing and interesting and affords us a valuable insight into the background of the day-to-day operations of the agricultural attaché and his work abroad. We are impressed by the description of the wide range of duties of these representatives of the Foreign Agricultural Service and are somewhat taken aback by the extent and varied nature of their tasks. Those of us who have had an opportunity to call on some of the attachés in various parts of the world will certainly agree with Tetro that the U.S. has a group overseas of whom we can justly be proud. We would like to attest to their skill in handling their varied tasks whether they be reporting, briefing a group on marketing policies, helping one to understand the intricacies of the local administration or merely tolerating a visitor.

I would like to confine my comments on the role of the attaché as described by Tetro to three points: the changing nature of the attaché's work, the need for more support of the attaché's work by economic studies and the need to coordinate the attaché's work with that of technical assistance experts when the attaché is located in a country where there is a mission.

My impression is that there has been a profound change in the emphasis in the role of the agricultural attaché since the war years. This change seems to me to be much more "than a new facet of an old jewel." I believe it is something fundamental and a part of the complex success story of increased U.S. agricultural output as well as part of the politics and economics of a divided world. Also this is a world in which the desire for economic development has become dominant in the thinking of many of the underdeveloped areas of the world, many of which are short of investment capital and most of which are short of hard currencies.

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The postwar change in the world's political and economic climate coincides with huge accumulations of surplus commodities in the U.S.A. A decision has been made to dispose of these commodities in foreign markets for local currencies and at favorable credit terms. This seems to me to have changed the attaché's role from a rather passive one of reporting, of providing an interchange of scientific information and assisting in trade to a much more active one. In this new role he is vitally concerned with the actual development of markets for the disposal of surplus commodities and with the use of these commodities as a means of winning friends and promoting economic development. In many parts of the world the attaché's role is now much more comprehensive than before—a large part of his duties are akin to those of a sales agent, albeit a unique type of agent, bent on selling U.S. surplus and using these to promote U.S. interests abroad.

If the agricultural attachés have been instrumental in the sale of surpluses their successes are self evident. Present exports of U.S. farm products under Public Law 480, the main surplus disposal law, have risen from 13 per cent of total exports of U.S. farm products in fiscal 1954-55 to around 32 per cent in fiscal 1956-57. In 1956-57 the value of Public Law 480 exports was \$1,530 million compared with only \$450 million in 1954-55. The attachés can be proud of the part they have played in developing markets for these products and in removing some of the burdens and surpluses that have been so evident in past years.

These successes have had their political repercussions, however, and I suppose that if the attaché takes credit for developing markets he must also bear some of the criticism that has gone with these sales. I refer to the complaints of the Canadians, Burmese, Argentinians and New Zealanders about unfair competition in the loss of traditional markets because of the favorable terms of sale under Public Law 480. Perhaps there is little that the attaché can do to influence policy. I merely wish to point out that this type of foreign reaction indicates the extent to which the attaché's role is now much more a part of foreign economic policy than before.

I agree with Tetro that the data in most countries are of such a nature that refined analysis would only give a sense of spurious accuracy. However, I wonder whether more intensive economic studies as to the nature of demand for some of the commodities being sold under Public Law 480 might not be rewarding. For instance, I have a strong suspicion that in many countries the demand for many agricultural products is much more elastic than we might believe. This impression is reinforced by the remarkable manner in which most world prices have held up despite increased supplies. If the demand is elastic or if the demand curves for



these products are kinked then the capacity to absorb surpluses at going prices will be much greater than anticipated. If this can be shown to be the case then surely it would have a strong influence on the extent of the surplus that can be sold without fear of depressing local markets. I believe this to be important enough to suggest that, in view of the very large amounts of surpluses moving into underdeveloped areas, the attaché be reinforced by permanent or temporary economic consultants who can provide him with required research findings and guidance on these matters.

My final point on the role of the attaché is his relationship with technical assistance missions. The attaché is interested in developing markets. He supervises the allocation of funds accruing from the sale of surplus commodities for projects that lead to opening up permanent markets for U. S. products. He is interested in having these funds used to build transport facilities, warehouses, storage facilities and so forth. As Tetro says he is *not* interested in providing technical assistance; yet, I would venture to suggest that these investments could well provide a complement to technical assistance projects that are being developed in many countries. Liaison between technical assistance missions and the attaché could be very profitable and my limited experience would indicate that this liaison is not as close as it might be.

These brief remarks are not intended to be critical of the attachés. As Tetro points out they are performing an admirable task in difficult circumstance. But, I feel that their changing role is such that they could well use more assistance than they have at present, particularly in the form of economists who could complement their work. Perhaps if, as Tetro has said, the disposal of surpluses is going to be a long-term process then we might go even further and suggest that the attachés' role is now seeming so complex that there should be a division of labor in their offices with a separation of "normal" functions from those of market development.

## TECHNOLOGY AND AGRICULTURAL PROGRESS

Chairman: Kenneth Bachman, Agricultural Research Service, USDA

### DIFFERENTIAL RATES OF CHANGE IN OUTPUT PER UNIT OF INPUT

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*Farm Economics Research Division, ARS, USDA*

**A**GRICULTURE has made outstanding progress in efficiency of production, especially during the last 15 years. Preliminary results of a study underway in the Farm Economics Research Division, Agricultural Research Service, point up the over-all magnitude and direction of these changes. From 1940 to 1955, the volume of farm output in the United States rose by 36 percent but aggregate production inputs increased by only 9 percent. This means an increase in output per unit of input of 25 percent during the period.

Marked changes in the composition of inputs accompanied this outstanding rise in productivity. In general, there was a rapid substitution of other inputs for both farm labor and farmland. During the period, inputs of total farm labor decreased about 30 percent and inputs of farmland and buildings rose only about 10 percent. Inputs of mechanical power and machinery more than doubled and use of commercial fertilizer and lime in 1955 was more than 3 times as great as in 1940. Nonfarm inputs of transportation, processing, and servicing associated with farmers' purchases of feed, livestock, and seed, nearly doubled during the period.

These changes in output per unit of input were not uniform over time or among enterprises and regions. Also differential changes in production efficiency, coupled with variations among products in income and price elasticity of demand have led, in many instances, to problems of adjusting production to changing market demands.

In view of their important relationship to the problems of adjustment and income in agriculture, there is need for accurate measurement of these differential changes in production efficiency. Equally important is the need for analyses of the causes of these changes and the nature and magnitude of the economic consequences to agriculture. Little work has been done so far in measuring and analyzing total inputs. In this paper, we shall attempt to develop a conceptual framework for analyzing (a) differences in magnitude of changes in output per unit of input, and (b) the economic consequences to agriculture of such differentials. On the basis of available data, we shall illustrate these concepts. Finally, some obser-

vations will be made on conclusions to be drawn regarding problems of agricultural adjustment and policy implications.

As the paper comes under the general heading of "Technology and Economic Progress," it is assumed that changes in technology and in output per unit of input are closely related. The authors are aware that factors such as scale of operations, changes in relative prices of factors and products, and changes in technology affect the output-input ratio over time. We are aware also of the impossibility of segregating the effects of "pure" changes in technology. Consequently, changes in the ratio of output to input are assumed to be general indicators of change in technology.

### *Reasons for Differences in Magnitude of Changes*

The task of analyzing the causes for differences in degree of change in production efficiency is fundamentally as broad as an analysis of the dynamics of a complex society. Nevertheless, a systematic approach should provide insight concerning some of the major factors involved.

At the outset, it is important to distinguish between (a) factors associated with additions to the inventory of adaptable innovations, and (b) factors associated with the rate of adoption of these available innovations.

Additions to the store of innovations are largely the result of basic and applied research both publicly and privately supported. Many of the adaptable innovations in agriculture are byproducts of industrial research and production. The economic feasibility of making available many innovations for agricultural use depends largely on the existence of a larger market than is provided by agriculture alone. The development of the automobile industry contributed greatly to the development of motor-trucks, tractors, and other farm machinery. Many products and by-products of the chemical and petroleum industry, such as anhydrous ammonia, pesticides, minor elements in fertilizer and formula feed, are transferred to the agricultural sector.

The quantity of adaptable innovations in agriculture is influenced also by other facets of the extent and density of the market for the innovation, in both agriculture and industry. The flow of innovations and the magnitude and density of the potential market tend to be positively correlated. This is due primarily to the economies of scale in production, distribution, and servicing of the innovation by industry. Illustrations of agricultural innovations whose use has been accelerated by markets that are extensive and/or of high density are: hybrid corn, which was first adapted to and adopted in the Corn Belt; the tractor; formula feeds and commercial fertilizers. Those innovations for which the market is limited come more slowly, if at all. A hop-harvesting machine and new seed varieties for minor crops are examples.

Another major variable that affects the store of adaptable innovations is the difficulty and cost of producing an innovation. An illustration of this is the difference in relative difficulty and cost of research with animals and crops. Differences in length of life cycles affect research costs, as do differences in the number of plants versus the number of animals that can be handled with a given research expenditure. The number and cost of "useful" mutations from radiation vary because of differences in number of "subjects," which arise because of the relatively more expensive nature of research with animals.

Many other factors affect the rate of addition to our store of adaptable innovations. Furthermore, complete analysis should recognize interrelationships among the factors and the role of chance in experimentation.

The rate of adoption of innovations is as important as their availability in explaining differences in changes in output per unit of input in agriculture. Economic factors are major determinants in the rate of adoption. In general, innovations that afford the greatest profit opportunity to the farmer are most readily adopted.

Changes in relative factor prices have an important bearing on the rate of adoption of innovations. The large increase in relative price of labor during the last 15 years, for example, has greatly stimulated adoption of labor-saving innovations. A major stimulant to adoption of labor-saving innovations in agriculture during the period was existence of ample nonfarm employment opportunities which resulted in rapid migration of workers from farms. Variations among regions in the price of farm labor relative to prices of other inputs, and in availability of nonfarm job opportunities, also help to explain regional differentials in rates of change in output per unit of input. An additional factor is the capital requirement of the innovation relative to availability and cost of capital. Some innovations, such as artificial insemination, are capital-saving in nature. Others, such as hybrid seed, require very little or no additional capital. Tractors and supplementary irrigation, on the other hand, require considerable capital. A factor closely associated with the capital requirement is the relative divisibility of capital. For example, hybrid seed or upbreeding of livestock can be gradually introduced on an individual farm while a combined harvester or equipment for bulk handling of milk calls for an immediate and complete change.

An economic factor that affects rate of adoption is the variation in the lapse of time before returns from the innovations are received. Some labor-saving innovations result in almost immediate returns by replacing hired labor. Several months time will elapse before a return is received from investment in fertilizer whereas returns from adoption of some machinery are spread out over several years. Among still other economic

factors that affect the rate of adoption of innovations are scale of operation and managerial ability.

Closely associated with, and having economic implications, are various physical factors that influence adoption of many types of innovations. A level topography lends itself more readily than a rough topography to the use of tractors, combines, and irrigation. Factors of this kind help to explain the early mechanization of farming in the Great Plains and the Corn Belt. Other physical factors, such as relative productivity of soils and variations in climate influence rate of adoption.

In addition to the economic and physical factors discussed above, still other factors exert considerable influence on the adoption of technology. These factors are described as industrial, institutional, or market factors. The effect of advertising, the "packaging" of technology in formula feeds and fertilizers, and the vertical integration of both industry and farming affects the rate of adoption of innovations. Availability and type of credit institutions, variations in the development of transportation facilities among areas, and many other institutional and industrial developments have their roles in determining the rate of adoption of technology in agriculture.

### *Economic Effects on Agriculture*

The economic effects on agriculture of changes in output per unit of input depend partly on the impact of such changes on the supply curve for farm products. We are assuming that changes in output per unit of input generally reflect corresponding changes in technology. With adoption of new technology, the supply curve of the individual farm usually shifts to the right. When adoption of any new technology becomes relatively widespread, there will be a shift to the right of the supply curve for agriculture. With no change in demand, the aggregate effect would be a lowering of prices of farm products.

The rapid increase in output per unit of input in agriculture suggests that there has been a substantial shifting to the right of the aggregate supply curve of farm products. But advances in technology have not been uniform among commodities or regions. Variations in changes in technology also have meant different degrees of shifting of the supply curves and hence, possibly, variable effects on prices of the various farm products.

The effect of changes in technology on the actual prices of farm products also depends largely on the nature of the demand curve and the change in demand for the particular farm product. Farm products vary widely in responsiveness of consumption to growth in consumers' incomes, prices, and other factors. For example, the income elasticity of

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demand is greater for livestock products than for food grains. Price elasticity of demand also varies significantly among agricultural commodities. Hence, differences in changes in technology as they influence supply and variations in changes in demand result in varying effects on prices and incomes.

It is important to distinguish between the situation of the individual farmer and that of farmers as a group. Farmers who first adopt new technology stand to gain in net income. Their unit costs are lowered and their additions to total production have little or no effect on the price of the product. Even after new technology becomes relatively widespread and the price of the farm product is lowered, there is an economic incentive to the "later" adopters. The economic rationalization from their viewpoint is much the same as that of the early adopters. Lower unit costs through use of new technology, coupled with the inability of individual producers to affect total production or price of the product, makes adoption profitable. These economic incentives have been among the most powerful influences on the rapid adoption by farmers of new technology.

Widespread adoption of new technology will be accompanied by an increase, a decrease, or no change in net income of farmers as a group. A given change depends on the growth of demand and on the income and price elasticity of demand for the particular product. The effect on net income also depends on the difference between changes in gross income and in total costs.

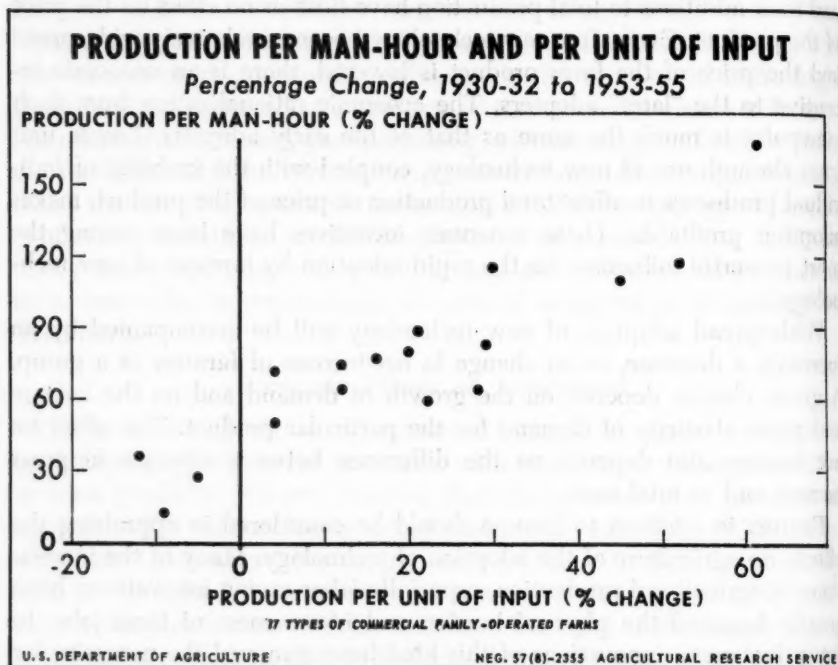
Factors in addition to income should be considered in appraising the effects on agriculture of the adoption of technology. Many of the innovations in agricultural production, especially labor-saving innovations, have greatly lessened the physical burden and irksomeness of farm jobs. In many instances, innovations of this kind have removed the necessity for long workdays. The need for employment of family labor has been reduced in many instances. Although it is difficult to measure quantitatively the effects of these other facets of technological change in agriculture, they should be considered in appraising gains to farm workers.

### *Empirical Illustrations*

There has been little empirical measurement of change in output per unit of total input in agriculture. Series of output per unit of total inputs are being developed for the United States as a whole from 1910 to date and are available for about 17 types of commercial family-operated farms since 1930. Wide variations in weather and in economic conditions make it difficult to analyze the data for commercial family-operated farms in terms of the concepts developed in this paper. Nor do the data for the

United States permit an examination of changes in technology except through time.

There is a wealth of data on production per man-hour in agriculture, and these data might be used to illustrate some of the concepts developed in preceding sections if they can be regarded as approximate indicators of change in technology. Analysis of data from the commercial family farm series indicates that changes in production per man-hour are highly correlated with changes in production per unit of total inputs.



In the accompanying figure percentage changes in production per unit of inputs from 1930-32 to 1953-55 are closely associated with changes in production per man-hour. A given percentage increase in production per unit of inputs is associated with a much larger percentage increase in production per man-hour, however. The same pattern of relationship between the two measures exists for most of the series for the various types of farms and also for preliminary series for the United States as a whole. Analysis of the data indicates that progressively larger percentage increases in production per unit of input are associated with a more accelerated rate of increase in production per man-hour.

The high correlation between changes in production per man-hour and in production per unit of input is not surprising when viewed against the background of technological progress in agriculture. The bulk of the innovations adopted in farm production have been of a direct, or indirect,

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labor-saving nature. The more rapid rise in production per man-hour than in production per unit of input also indicates that there has been considerable substitution of capital for labor. Nevertheless, indexes of production per man-hour serve as general indicators of change in technology, and major differences in the movement of such indexes can be used to classify various farm products in this regard.

Differences in technological changes, measured in terms of percentage changes in production per man-hour, are illustrated in Table 1 for several

TABLE 1. CHANGE IN FARM PRODUCTION PER MAN-HOUR BY SPECIFIED PRODUCTS AND PERIODS, UNITED STATES

Product	1910-12 to 1953-55	1939-41 to 1953-55	1927-29 to 1939-41	1918-20 to 1927-29
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Food grains.....	386	134	35	39
Feed grains.....	316	177	24	12
Cotton.....	182	97	40	4
Poultry products.....	82	59	12	4
Dairy Products.....	78	49	4	14
Tobacco.....	27	26	10	-5
Meat animals.....	26	13	2	8
All crops.....	180	87	28	10
All livestock.....	64	44	5	7

groups of products and for various periods. A combination of many variables accounts for these differences. Nevertheless, the differences can be partially explained in terms of the previously discussed factors that influence (1) the rate of addition to the inventory of innovations and (2) the rate of adoption of available innovations.

The comparative difficulty and cost of research, from which additions to the inventory of innovations are derived help to explain the fact that production of food grains per man-hour increased 386 percent from 1910-12 to 1953-55, while production of meat animals per man-hour increased only 26 percent.<sup>1</sup> This factor undoubtedly contributed to the spread between the increase in productivity per man-hour on poultry products of 82 percent, and that of 26 percent on meat animals. Even in an aggregate sense, the relative difficulty and cost of research on crops versus livestock is illustrated by the fact that production per man-hour

<sup>1</sup> The periods selected for measuring changes in production per man-hour, and in relative prices of farm products, do not include the period 1930-32 to 1953-55 used in correlating changes in production per man-hour and per unit of total inputs. The latter period was selected because it measured changes over the entire time span for which data were available for the various types of commercial family-operated farms. The period 1910-12 to 1953-55 and the other periods used in the analysis that follows were selected, so far as possible, to minimize major variations in levels of prices, weather, and so on. Refer to figure on production per man-hour and per unit of input.

increased 180 percent from 1910-12 to 1953-55 for all crops and only 64 percent for all livestock.

Another important factor that affects the inventory of innovations—the extent and density of the market for innovations—helps to explain some of the differences in change in labor productivity. For example, because of differences in the extent of the market, there is greater economic incentive to develop innovations that could be adapted to production of food and feed grains than to production of tobacco. This factor, together with differences in the relative difficulty of mechanizing production of these crops, accounts for the variations in the adoption of technology in the production of these two crops.

Differences in the rate of adoption of innovations are closely associated with variations in the profitability to farmers of particular innovations. This in turn depends on many variables, such as relative prices of commodities and innovations, the responsiveness of different crops to innovations such as fertilizer, the scale of operation, and so on. For example, apparently it has been profitable to adopt innovations in cotton production at a more rapid rate in the Pacific and West South Central regions than in the South Atlantic and East South Central geographic divisions.

TABLE 2. CHANGE IN COTTON PRODUCTION PER MAN-HOUR, BY SPECIFIED PERIODS AND GEOGRAPHIC DIVISIONS

Region	1919-20 to 1953-55	1939-41 to 1953-55	1927-29 to 1939-41	1919-20 to 1927-29
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
South Atlantic.....	92	56	27	-3
East South Central....	167	71	25	25
West South Central....	200	106	46	0
Pacific.....	225	117	26	19

This is exemplified by the fact that cotton production per man-hour between 1939-41 and 1953-55 more than doubled in the two western regions but increased by only about 60 percent in the South Atlantic and East South Central regions (Table 2). This difference was the result of such factors as greater adaptability of machinery on the larger operations in the western regions, irrigation, soil productivity and response to fertilizer, and the greater relative cost of labor as an inducement to mechanization in the West.

The rate of technological change varies over time, as illustrated by the data in tables 1 and 2. The economic conditions that existed during and after World War II, for example, were conducive to a rapid rate of technological development and adoption. The change in production per man-hour from 1939-41 to 1953-55 greatly exceeded that in previous periods. From 1927-29 to 1939-41, for example, production of dairy products per man-hour increased by only 4 percent, whereas in the more

recent period it increased by 50 percent. Primary reasons for differences over time in technological adoption have been increases in the relative price of labor and in nonfarm employment opportunities. These increases stimulated labor-saving innovations.

Development of technology in the fertilizer-production sector of the economy has meant that fertilizer costs have advanced at a slower rate than costs of most other inputs in farm production. This has stimulated the use of more fertilizer, increased yields, and stepped up output per man-hour of labor.

It is impossible with the data available to measure income effects to farmers of such combinations of changes in supply and demand. But changes in relative prices of the various farm products provide a clue to probable income effects. The data in Table 3 generally support the

TABLE 3. CHANGE IN FARM PRODUCTION PER MAN-HOUR AND IN RELATIVE PRICES OF PRODUCT, SPECIFIED PRODUCTS AND PERIODS, UNITED STATES

Item	Meat animals	Poultry products	To- bacco	Feed grains	Dairy products	Food grains
	Percent	Percent	Percent	Percent	Percent	Percent
1910-12 to 1953-55						
Production per man-hour.....	26	82	27	316	78	386
Relative product price <sup>1</sup> .....	18	-20	92	-19	5	-11
1939-41 to 1953-55						
Production per man-hour.....	13	59	26	177	49	134
Relative product price <sup>1</sup> .....	-1	-20	25	4	-10	13
1927-29 to 1939-41						
Production per man-hour.....	2	12	10	24	4	35
Relative product price <sup>1</sup> .....	11	-5	20	-8	3	-9
1918-20 to 1927-29						
Production per man-hour.....	8	4	-5	12	14	39
Relative product price <sup>1</sup> .....	12	7	-5	-16	24	-24

<sup>1</sup> Relative price was calculated by dividing the index of prices received by farmers for the particular group of products by the index of prices received by farmers for all farm products. Percentage change in this ratio over time provides a measure of change in relative price.

concepts developed earlier in the paper. Meat animals and food grains probably represent the extremes in demand characteristics of the product groups covered in the table. Both income and price elasticity of demand have been greater for meat animals than for food grains. These two product groups also represent extremes in technological progress.

Production of meat animals per man-hour increased by only a fourth from 1910-12 to 1953-55. In contrast, production of food grains per man-hour almost quadrupled during the period. The increase of nearly one fifth in relative prices of meat animals and the decrease of about one tenth in relative prices of food grains coincide with the concepts of economic effects developed earlier.

This approximate relationship among changes in production per man-hour and in relative prices of meat animals and food grains also holds



for the periods 1927-29 to 1939-41 and 1918-20 to 1927-29. The changes from 1939-41 to 1953-55 depart from theoretical expectation. This is due largely to the unduly low relative prices of meat animals in 1953-55. The position on the cattle cycle and the very large production of hogs in the latter part of the period were chiefly responsible for this price position of meat animals. Higher support prices for food grains in the later period also help to explain the departure from theoretical expectation.

Meat animals and poultry products illustrate another combination of demand situation and differences in technological change. Income and price elasticity of demand for these two product groups probably do not differ greatly. But technological progress in production of poultry products has outstripped that in output of meat animals. As a result, relative prices of poultry products have dropped compared with prices for meat animals, as is indicated in Table 3.

Tobacco is similar to meat animals, in both demand and rate of change in technology of production. For most of the periods covered, however, tobacco has gained, compared with meat animals, in relative price of product. Different impacts of government programs on prices of the two groups of products probably is the important factor in this relationship.

The varying impact of government programs on product prices also may be the chief reason for some of the departure from theoretical expectations in the comparison of feed grains and food grains. Technological progress has been outstanding in the production of both groups of grains. But income and price elasticity of demand has been much greater for feed grains than for food grains.

Dairy products represent a demand situation intermediate between that for food grains and meat animals. Variations in the demand for products that make up the dairy products group, impacts of government programs, and other factors make it difficult to compare the price effects of changes in technology in dairying with those for other products.

### *Summary and Conclusions*

An adequate analysis of changes in output per unit of input is limited by the lack of data on total inputs. Nevertheless, on the basis of readily available data we were able to indicate the approximate magnitude of changes and to test some hypotheses regarding causes for the differences and their economic implications to agriculture.

The use of changes in production per man-hour as a general indicator of change in output per unit of total inputs and in technology is promising. We plan to experiment further with indexes of production per combined unit of labor and land in the case of crops and of labor and feed for livestock. Measures of this kind could be calculated mainly from

readily available data, and could represent further progress toward the more ideal measure based on total inputs.

In any event, improved measures of changes in production efficiency in agriculture are needed. These improved measures, plus analyses of the causes of changes and their economic implications, could prove to be useful guides for developing adjustment programs for agriculture. Measurement and analysis of this kind needs especially to be directed toward the problem of aggregate production response in agriculture. Research progress in the latter area, however, may require a much more complete measurement and analysis of changes in all the important inputs.

#### DISCUSSION: DIFFERENTIAL RATES OF CHANGE IN OUTPUT PER UNIT OF INPUT

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The objectives of the paper by Barton and Loomis are (1) to develop a conceptual framework for analyzing differences in magnitude of changes in output per unit of input and the economic consequences to agriculture of such differentials, (2) to test these concepts with some empirical data and (3) to make some conclusions on problems of agricultural adjustment and policy implications. The authors discuss the first two objectives at some length but give only a short paragraph at the end of the paper to the last objective. In addressing themselves to the last objective, the authors merely state that we need improved measures of changes in production efficiency in agriculture, and that these measures, along with analyses of causes and economic implications of changes in agricultural production efficiency, could prove to be useful guides for developing adjustment programs in agriculture.

Barton and Loomis assume that changes in technology and in output per unit of input are closely related. Hence, they assume changes in output per unit of input to be general indicators of technological change. Moreover, since their data show production per man hour to be highly correlated with changes in production per unit of total inputs, the authors decided to use changes in production per man hour as a measure of technological change. As a measure of technological change production per man hour has several limitations. The authors do say that they are well aware that factors such as scale of operations, changes in relative prices of factors and products, factor substitution, along with changes in technology, influence input-output ratios overtime. Perhaps we need to spell out more fully some of the limitations of production per man hour as a measure of technological change.

First, in the paper under discussion, the input-output ratios lack definition. The reader is not told how these ratios were calculated. Knowledge of how these ratios were calculated would help the reader interpret the strength and limitations of these ratios as measures of technological change. For example, if we know that ratios of production per man hour at different points in time have been computed by dividing the gross product by total man hours, we then also know that all of the product has been imputed to labor and none to the other resources used with the labor. Consequently, changes in the ratios over time depend especially on changes in quantities of other resources used with labor.<sup>1</sup> For this reason, gross production per man hour can be most unreliable as a measure of technological change.

Barton and Loomis say that food grains and meat animals represent extremes in technological progress. This statement is based on the data in Table 1 of their paper. These data show much larger percentage increases in production per man hour for food grains than for meat animals during the 1910-12 to 1953-55 period and all interim periods. The picture is much the same when all crops are compared with all livestock. These data along with those below furnish a basis for a further discussion of limitations, namely, that changes in production per unit of labor alone are perhaps not sufficiently reliable as a measure of technological change, especially when comparing enterprises or sectors of an industry. The authors say that the bulk of the innovations adopted in farm production have been of a direct, or indirect, labor-saving nature. This statement appears to be more valid for crops than for livestock. Most of the technological change in livestock production is associated with improvements in breeding and in rations. Thus, when technological change in crop and livestock production is measured, as below, by changes in crop produc-

CHANGES IN FARM PRODUCTION AS INDICATED BY CHANGES IN CROP PRODUCTION PER ACRE AND BY PRODUCTION PER BREEDING UNIT FOR SPECIFIED PERIODS, UNITED STATES

	1919-20 to 1953-55	1939-41 to 1953-55	1927-29 to 1939-41	1919-20 to 1927-29
	Percent	Percent	Percent	Percent
Crop production per acre	23.8	17.0	8.6	-1.2
Production per breeding unit	64.7	19.1	14.6	20.5

Source: 1957 *Agricultural Outlook Charts*, USDA, AMS, ARS, Washington, D. C., November 1956.

tion per acre and in production per breeding unit (capital input-output ratios) technological change appears much greater in livestock than in crops. By using production per man hour as a measure, Barton and Loomis conclude exactly the opposite.

<sup>1</sup> During the period discussed by the authors, cash farm operating expenses increased sharply relative to other inputs.

The following diagrams further illustrate the limitations of production per man hour as a measure of technological change and hence suggest that if this ratio is used it be used with considerable caution. The two diagrams in Figure 1 illustrate a situation where this ratio, or output per unit of capital, or output per unit of total input is a reliable measure of technological change.

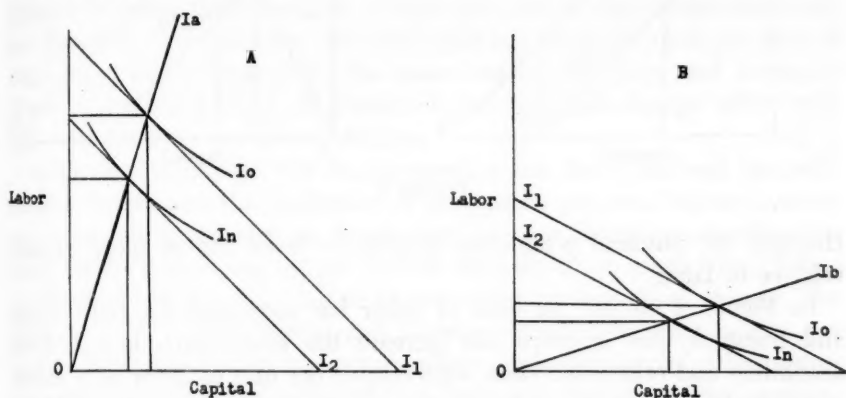


FIGURE 1

Let the left-side diagram represent Region A and the right-side diagram, Region B. Further assumptions underlying this situation are: (1) isoquant,  $I_o$  (production with old technology) in A is equal to  $I_o$  in B and isoquant  $I_n$  (production with new technology) in A is equal to  $I_n$  in B, (2) iso-outlay line,  $I_1$  in A is equal to  $I_1$  in B and iso-outlay line,  $I_2$  in A is equal to  $I_2$  in B, (3) labor costs twice as much in Region B as in A but capital costs the same in the two regions.<sup>2</sup>

The technical nature of the production phenomena illustrated in Figure 1 is characteristic of that expressed by the Cobb-Douglas function and is indicated by the linear nature of the isoclines ( $I_a$  and  $I_b$ ) which are also scale lines in this situation. In Figure 1, output per unit of labor, per unit of capital and per unit of total input increases for both regions as a consequence of adopting the new technology. Furthermore, the percentage increase is the same for both regions no matter which of the three measures is used.

The set of diagrams in Figure 2 is a crop-livestock comparison. The assumptions here are: (1)  $I_o$  in crops is equal to  $I_o$  in livestock and  $I_n$  in crops is equal to  $I_n$  in livestock, (2)  $I_1$  in crops is equal to  $I_1$  in livestock and  $I_2$  in crops is equal to  $I_2$  in livestock, (3) factor-price ratios are the same for crops and livestock, and (4) in crops the new technology has

<sup>2</sup> Actually in this situation different factor-price ratios are not a restrictive assumption nor are equal outputs with the old and the new technology. For all three ratios to be reliable measures of technological change, the only restriction is that technological change give rise to no substitution effects.

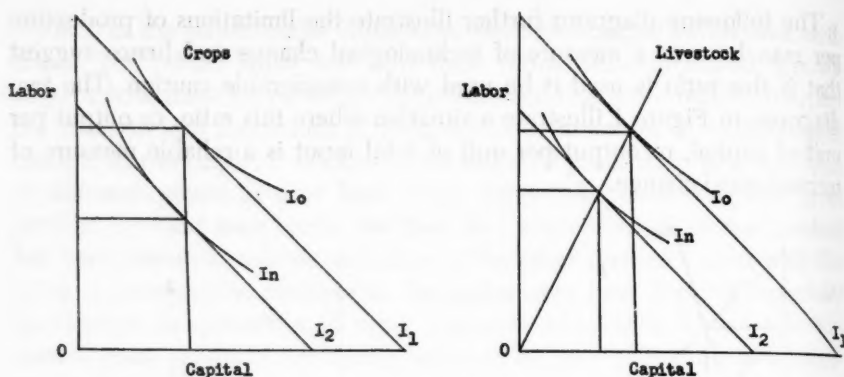


FIGURE 2

changed the physical production process to favor use of more capital relative to labor.

In Figure 2 output per unit of labor has increased for both crops and livestock, but in crops the increase has been much larger, both absolutely and relatively. Thus, with output per unit of labor as a measure of technological change, crops show much the greater change. However, with output per unit of capital as a measure, livestock show much the greater technological change. In livestock, output per unit of capital has increased both absolutely and relatively, but no increase has occurred in crops. When technological change is measured by output per unit of total input, crops and livestock show the same increases. In this situation (Figure 2) conclusions on extent of technological change differ with the ratio selected for measuring this change.

The set of diagrams in Figure 3 is also a crop-livestock comparison. The assumptions are similar to those for Figure 2 with one exception.

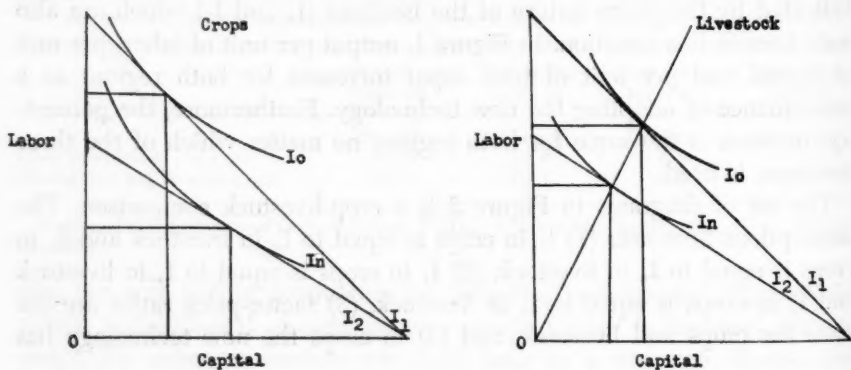


FIGURE 3



In Figure 3 the price of labor has changed along with the technology. A given outlay after the technological change buys less labor than before the change but capital costs remain unchanged. Thus, all four iso-outlay lines represent equal outlays.

In this situation (Figure 3) output per unit of labor has increased absolutely and relatively for both crops and livestock but the increase is far greater in crops than livestock. Output per unit of capital has increased for livestock but this ratio has decreased for crops. Output per unit of total input has increased by the same amount for crops and livestock. Here again conclusions on extent of technological change differ with the ratio used for measuring change.

Additional situations can be constructed but these outlined are sufficient to emphasize the limitations of production per man hour as a measure of technological change. Production per unit of labor in combination with other ratios or output per unit of total input are more reliable than production per man hour alone in measuring technological change. The high correlation that Barton and Loomis obtained between output per unit of input and production per man hour for various types of farms may very well be due to the technological changes in crop production on these various types of farms. One wonders if the same high correlation exists for food grains, feed grains, cotton, poultry products, dairy products, tobacco and meat animals taken separately.

The authors are wrestling with a significant but difficult problem in analysis. They are in the process of experimenting with new indexes of technological change. Perhaps we might suggest that they also experiment with how marginal value productivities of various farm resources change with changes in technology.

## AGRICULTURAL AND NONAGRICULTURAL GROWTH IN OUTPUT PER UNIT OF INPUT\*

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**E**CONOMIC progress is generally conceived in terms of a rising level of both total and per capita consumption or real income. Defined in this manner economic progress can occur (1) as a result of changes that enable us to produce a greater output with the expenditure of a given quantity of resources and (2) as a result of an increase in the quantity of other productive resources relative to labor.

Historically, students of economic growth have given major attention to the problems associated with capital accumulation and the substitution of capital for labor. In recent years increased attention has been given to factors that permit the production of a greater output from a given quantity of input.

Change in output per unit of input can, under certain rather restrictive conditions, provide a precise measure of the resource savings (or increased output) due to technological change. These conditions are as follows:<sup>1</sup>

*First*, resource and product combinations must be identical to the combinations that would be employed under conditions of competitive equilibrium in both periods.

*Second*, the production function must be homogeneous of degree one, that is, constant returns to scale must hold.

*Third*, technological progress must be neutral, that is, the marginal rate of substitution among factors must be the same in both periods.

*Fourth*, the prices of factors of production relative to each other and the prices of the products of the firm (or industry) relative to each other must remain unchanged.

In spite of the fact that these conditions are rarely, if ever, exactly met there is little doubt that change in output per unit of total input does provide a more adequate indicator of technological change than change in average labor productivity—output per unit of labor input—a measure that has received wide acceptance as an indicator of techno-

\* Journal paper 1155 of the Purdue Agricultural Experiment Station, Project #917, *The Contribution of Technological Change to Farm Output*. The project is financed under a grant from the National Science Foundation.

\*\* The author wishes to express appreciation to Tom Stout, Harald Jensen, J. C. Bottum, Earl Kehrberg, Paul Farris, R. L. Kohls and Charles E. French for helpful comment and criticism on an earlier draft of this paper. Dr. Stout is in charge of the major line of research under project #917.

<sup>1</sup> For a demonstration of these propositions see Vernon W. Ruttan, *Technological Progress in the Meatpacking Industry, 1919-47*, USDA, Marketing Research Report #59, January 1954, pp. 19-24.

logical change until fairly recently.<sup>2</sup> And I assume the interest in output per unit of total input as an indicator of the differential rates of technological change in agriculture and in the nonagricultural industries led to the choice of this topic for discussion today.

### *Definition and Measurement*

If one accepts change in output per unit of total input as an indicator of the resource savings due to technological change, a number of technical problems remain.

*One requirement of any measure of change in output per unit of total input that is to be used for interindustry comparisons is that the weighted average of the rates of change in output per unit of input achieved by individual industries should equal the rate of change achieved by the economy as a whole.*

This requirement is met only when output is measured by "value added"—that is net of intermediate products consumed in the process of production.<sup>3</sup> Of the several measures of farm output one might construct, only those similar to the U. S. Department of Commerce series on "Gross National Farm Product in Constant Dollars"<sup>4</sup> represent a conceptually satisfactory measure for use in interfirm, interindustry or interregional comparisons. Use of other measures, such as the ARS index of farm output or the AMS index of farm production for sale and home consumption, meet this requirement only if the ratio of net output to gross output does not change.

*A second major problem involves the choice of base periods to be used in aggregating indexes of total output and total input.* This is the familiar index number problem.<sup>5</sup> When beginning-period (Laspeyre) weights are

<sup>2</sup>If all of the conditions listed above hold, then both measures—output per unit of total input and output per unit of labor input—represent equally satisfactory indicators of technological change. It is only when the four conditions specified above do not hold that output per unit of total input provides a more precise measure of technological change than output per unit of labor input. The problems of definition and measurement discussed in Section II (below) arise mainly because these conditions do not hold.

<sup>3</sup>Kenneth May, "Technological Change and Aggregation," *Econometrica*, Vol. 15, January 1947, pp. 51-63. See also Ruttan, *op. cit.*, pp. 24-28; John W. Kendrick, *Productivity Trends: Capital and Labor*, National Bureau of Economic Research, Inc., New York, 1956, pp. 3-6. For a discussion of the effect of omission of a relevant input see Zvi Griliches, "Specification Bias in Estimates of Production Functions," *Journal of Farm Economics*, Vol. XXXIX (February 1957), pp. 8-20.

<sup>4</sup>"'Gross' national product originating in farming, or in any other single industry, measures the value added by the industry to the products it consumes in production. It is 'gross' of capital consumption but is 'net' in the important sense that there is no double counting of products raised by farmers, or purchased from other industries, for use in further farm product." John W. Kendrick and Carl E. Jones, "Gross National Farm Product in Constant Dollars, 1910-50," *Survey of Current Business*, Vol. 31 (September 1951), p. 13.

<sup>5</sup>For a discussion of the index number problem in relation to the problem of meas-

used the effect is to bias downward the measure of technological change. With end-period (Paashe) weights the effect is to bias the measure upward. If the first three conditions listed above—competitive equilibrium, constant returns to scale, and neutral technological change—hold, the “true” measure of technological change can be bracketed by using both beginning-period and end-period weights. If the neutrality or the scale conditions are not met, only an upper or a lower “limit” to the “true” measure of technological change can be established.<sup>a</sup>

*A third conceptual problem is associated with the method of aggregation to be used in arriving at a measure of “total” input. Specifically*

TABLE 1. AVERAGE ANNUAL PERCENTAGE RATES OF CHANGE IN “NET” OUTPUT PER UNIT OF TOTAL “NET” INPUT, OUTPUT PER UNIT OF LABOR INPUT AND OUTPUT PER UNIT OF CAPITAL INPUT IN SELECTED INDUSTRIES, 1899–1953  
(Output measured in terms of value added)

	Long period	Major subperiod		Recent subperiod	
	1899– 1953	1899– 1919	1919– 1953	1919– 1948	1948– 1953
1. Output per unit of total input in:					
Total private domestic economy	1.7	1.1	2.2	—	—
Agriculture <sup>a</sup>	0.9	0.0	1.4	1.5	1.1
Manufacturing <sup>b</sup>	0.9	–0.5	—	1.8	—
Mining <sup>c</sup>	—	—	—	—	—
2. Output per unit of labor input in:					
Total private domestic economy	1.9	1.4	2.3	—	—
Agriculture <sup>a</sup>	1.6	0.5	2.3	2.2	2.7
Manufacturing <sup>b</sup>	1.8	0.8	—	2.4	—
Mining <sup>c</sup>	3.1	2.3	—	3.9	—
3. Output per unit of capital input in:					
Total private domestic economy	1.1	0.2	1.7	—	—
Agriculture <sup>a</sup>	0.2	–0.5	0.6	0.8	–0.2
Manufacturing <sup>b</sup>	0.3	–1.2	—	1.5	—
Mining <sup>c</sup>	0.1	–1.2	—	2.2	—

<sup>a</sup> Data for agriculture are for 1899–1955, 1919–55 and 1948–55 rather than as indicated in the headings.

<sup>b</sup> Data for manufacturing are for 1900–1948 and 1900–19 rather than as indicated in the headings.

<sup>c</sup> Data for mining are for 1890–1948 and 1890–1919 rather than as indicated in the headings. Source: (1) Rates of change for total private domestic economy is from John W. Kendrick, *Productivity Trends: Capital and Labor*, Occasional Paper 53, National Bureau of Economic Research, Inc., 1956, p. 14, Table 3.

(2) Rates of change for other sectors calculated from data presented in Table 3.

should the inputs be aggregated arithmetically or geometrically? The question of linear vs. nonlinear aggregation of individual inputs is essentially a problem in production theory. If one constructs a production function for some base period and substitutes the inputs employed in a

uring technological change, see George W. Ladd, “Biases in Certain Production Indexes,” *Journal of Farm Economics*, Vol. XXXIX (February, 1957) pp. 75–85. Also Ruttan, *op. cit.*, pp. 15–20.

<sup>a</sup> Ruttan, *op. cit.*, p. 20.

second period, the difference between the estimated output and the actual output is the contribution technological change has made to output between the two periods. Arithmetic aggregation is equivalent to the choice of a linear production function. Production theory would favor the choice of a nonlinear production function.<sup>7</sup>

Table 1 compares the total and partial input-output ratios between

TABLE 2. AVERAGE ANNUAL PERCENTAGE RATES OF CHANGE IN "GROSS" OUTPUT PER UNIT OF TOTAL "GROSS" INPUT, OUTPUT PER UNIT OF LABOR INPUT AND OUTPUT PER UNIT OF CAPITAL INPUT IN SELECTED INDUSTRIES, 1899-1953

(Output measured in terms of sales)

	Long period	Major subperiod		Recent subperiod	
	1899- 1953	1899- 1919	1919- 1953	1919- 1948	1948- 1953
1. Output per unit of total input in:					
33 industry groups <sup>a</sup>	2.3	1.4	2.9	—	—
Agriculture <sup>b</sup>	1.1	0.7	1.3	1.2	1.9
Manufacturing	—	—	—	—	—
Mining	—	—	—	—	—
2. Output per unit of labor input in:					
33 industry groups <sup>a</sup>	2.6	1.8	3.2	—	—
Agriculture <sup>b</sup>	2.2	0.7	2.9	2.6	3.9
Manufacturing <sup>c</sup>	2.1	1.1	2.6	2.5	2.7
Mining <sup>c</sup>	3.0	2.4	—	3.4	—
3. Output per unit of capital input in:					
33 industry groups <sup>a</sup>	1.4	-0.2	2.3	—	—
Agriculture <sup>b</sup>	0.7	-0.3	1.2	1.3	0.9
Manufacturing <sup>d</sup>	0.4	-1.1	—	1.6	—
Mining <sup>e</sup>	0.0	-1.2	—	1.8	—

<sup>a</sup> Includes agriculture, 5 mining, 20 manufacturing, 2 transportation and 5 communications and utilities industries.

<sup>b</sup> Data for agriculture are for 1899-55, 1919-55 and 1948-55 rather than as indicated.

<sup>c</sup> Data on output per unit of labor input in manufacturing are for 1900-1953 and 1880-1919 rather than as indicated.

<sup>d</sup> Data on output per unit of capital input in manufacturing are for 1890-1918, and 1900-1919 rather than as indicated.

<sup>e</sup> Data for mining are for 1890-1948 and 1890-1919 rather than as indicated.

Source: (1) Rates of change for 33 industry groups from John W. Kendrick, *Productivity Trends: Capital and Labor*, Occasional Paper 53, National Bureau of Economic Research, Inc., 1956, p. 14 (Table 3).

(2) Rates of change for other sectors calculated from data presented in Table 3.

agriculture and selected nonagricultural industries. The output data are calculated on a value added basis, and the terms total "net" output, total "net" input, and "net" input-output ratio are used. Table 2 illustrates the influence of measuring output on a basis of sales rather than value added.

<sup>7</sup> See Zvi Griliches, *op. cit.*, p. 8-20; V. W. Ruttan, "The Contribution of Technological Progress to Farm Output; 1950-75," *Review of Economics and Statistics*, Vol. XXXVIII (Feb., 1956), pp. 61-69, especially p. 63. A nonlinear production function implies that a greater increase in inputs will be required to achieve a given increase in output for any given level of technological change than if the production function is linear, except in the case where the use of all inputs changes at the same rate or where marginal rate of substitution between input factors remains unchanged.



In Table 2, the terms total "gross" input and total "gross" output and "gross" input-output ratio are employed. The term "partial" input-output ratio is used to refer to average total ("gross" or "net") output per unit of labor input and/or average total ("gross" or "net") output per unit of capital input. The input-output ratios presented in tables 1 and 2 are based on the indexes presented in Table 3.<sup>8</sup>

The economic conditions do not meet, in detail, the four conditions that must hold for a precise measure of the resource savings due to technological change. Beginning- and end-period weights have not been used to aggregate the several inputs into indexes of "net" and "gross" input. A linear rather than a nonlinear method of aggregation has been employed. In my judgment, however, the data provide an adequate foundation for the analysis.

#### *Input-Output Comparisons: Agriculture and Nonagriculture*

Of special interest to agricultural economists is the fact that *growth in the total "net" input-output ratio in agriculture compares favorably with growth in the total "net" input-output ratio in manufacturing throughout the entire period since 1899.* Both sectors have experienced a rate of growth of about 0.9 percent per year. Neither agriculture nor manufacturing experienced any gain in the total "net" input-output ratio between 1899 and 1919. During the period between 1919 and 1948, both sectors experienced an increasingly rapid rate of growth. And both have experienced some decline in the rate of growth in output per unit of total "net" input in the years since 1948.<sup>9</sup>

On the other hand, *output per unit of total input in both agriculture and manufacturing has lagged relative to other major industrial sectors of the economy throughout the entire period since the turn of the century.* Apparently the mining, transportation, communication, and utilities industries have experienced even more rapid increases in the "net" input-output ratios than agriculture or manufacturing. The trade and service industries have probably experienced the slowest rate of growth.<sup>10</sup>

<sup>8</sup> In preparing these tables, I have drawn heavily upon the recent studies by Kendrick, Creamer, and Borenstein of the National Bureau of Economic Research (NBER) for data on the nonagricultural sector. Glenn Barton of the Farm Economics Branch, ARS, Warren Scoville and James Munger of the Agricultural Finance Section, ARS, and Robert Masucci of the Farm Income Section, AMS, have been especially helpful in providing the data on which the calculations for the farm sector are based.

<sup>9</sup> Data on growth in output per unit of total input for the manufacturing sector is not presented in tables 1-3. This statement, for the manufacturing sector is based on data from John W. Kendrick which will be published by the National Bureau in the near future.

<sup>10</sup> The long-term rate of growth in average "gross" output per unit of labor input in retail and wholesale trade is 1.1 percent per year. This is well below the rate of growth in agriculture, manufacturing, mining, the 33-industry aggregate, or the pri-

A comparison between agriculture and mining would have been especially interesting since they are the two industries that are relatively land intensive. Unfortunately the NBER data on the mining industry shows mining capital exclusive of land. The partial input-output ratios available indicate that the rapid increase in resource savings in mining began earlier than in either agriculture or manufacturing and has continued at a more rapid rate.

*Since 1919 a remarkable shift has occurred in the American economy. Technological change became capital saving as well as labor saving.* Output began to expand relative to inputs of both capital and labor. The consequence was a marked increase in the rate of growth of output per unit of total input. Agriculture participated in this shift along with manufacturing and the other major industrial sectors. The somewhat slower rate of growth in output per unit of capital input in agriculture probably reflects the importance of land as a component of total agricultural capital.

Since 1948 in both agriculture and manufacturing we have seen a reversal of trend with extremely rapid rates of increase in output per unit of labor input and a decrease in output per unit of capital input.<sup>11</sup> This may merely reflect a catching up of capital inputs following the replacement lag during World War II and the Korean incident. On the other hand it could represent a genuine reversal of the 1919-1948 trend.

In retrospect, the characteristic patterns of technological change in the period before 1919—with decreases in output per unit of capital input largely offsetting increase in output per unit of labor input—clarify a number of issues in the literature of agricultural economics and economics generally. Most obvious for agriculture is the relationship between the role of technological change and the choice of the 1910-14 parity base. Between 1899 and 1919 there was virtually no increase in "net" output per unit of total "net" input in agriculture. Technological change in agriculture was unable to do little more than offset the effect of diminishing returns. Sharp increases in farm prices were required to achieve the expansion in farm output required by a rapidly expanding national economy.

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vate domestic economy. Harold J. Barger, *Distribution's Place in the American Economy Since 1869*, National Bureau of Economic Research, General Series, No. 58, Princeton University Press, 1955, pp. 37-52. Estimates of output per unit of capital input for the distribution sector are not available.

<sup>11</sup> As used in this section, the term capital-saving (labor-saving) innovation refers to an innovation or a complex of innovations resulting in a decline in the quantity of capital (labor) required to produce a given output. This definition is consistent with the definition employed by Lange, "A Note on Innovations," *Review of Economics and Statistics*, Vol. XXV (1943), pp. 19-25, rather than the definition given by Hicks in *The Theory of Wages*, Macmillan, London, 1932 or Robinson in "The Classification of Inventions," *Review of Economic Studies*, Vol. V. (1937-38), pp. 139-142.

TABLE 3. INDEXES OF OUTPUT AND INPUT IN SELECTED INDUSTRIES, 1890-1955

	1890	1899	1919	1929	1948	1953	1954	1955
1. Agriculture								
"Gross" output		83	100	113	153 <sup>a</sup>	166	166	172
"Net" output		88	100	107	134 <sup>a</sup>	137	137	139
Total "gross" input		95	100	105	108	111	110	111
Current inputs <sup>a</sup>		75	100	133	213	236	239	244
Total "net" input		88	100	98	88	87	85	85
Labor input		96	100	98	72	64	62	62
Capital input		78	100	98	107	115	113	113
2. Manufacturing <sup>b</sup>								
"Gross" output		48	100	—	282	373	357	387
"Net" output		51	100	—	276	—	—	—
Current inputs		—	—	—	—	—	—	—
Total "gross" input		—	—	—	—	—	—	—
Total "net" input		46	100	—	163	—	—	—
Labor input		60	100	104	139	158	—	—
Capital input		38	100	—	—	—	—	—
3. Mining								
"Gross" output	27.7		100	159	232	254	247	270
"Net" output	28.6		100	—	253.3	—	—	—
Total "gross" input	—		—	—	—	—	—	—
Current inputs	—		—	—	—	—	—	—
Total "net" input	—		—	—	—	—	—	—
Labor input	55.8		100	—	84.5	—	—	—
Capital input (exclusive of land)	16.4		100	150	136	—	—	—

<sup>a</sup> Current inputs for 1899 estimated from 1910-19 trend.

<sup>b</sup> Data for 1900 rather than 1899.

<sup>c</sup> Represents 1947-48 average because of marked fluctuations in farm output during 1947-49.

Source: 1. Agriculture: (a) Data for 1910-1955 represent preliminary tabulations of data from Purdue Agricultural Experiment Station Project 917 on the Contribution of Technological Change to Farm Output. (b) Data on "net" output, total "net" input, and labor and capital inputs for 1899-1909 supplied by John W. Kendrick. (c) Data on "gross" farm output, 1899-1910 are from Frederick Strauss and Louis H. Bean, *Gross Farm Income and Indexes of Farm Production and Prices in the United States, 1869-1937*. U. S. Department of Agriculture (in cooperation with the National Bureau of Economic Research), Technical Bulletin No. 703 (Dec. 1940), p. 125.

2. Manufacturing: Indexes for 1900, 1919 and 1948 are based on data in Daniel Creamer, *Capital and Output Trends in Manufacturing Industries, 1880-1948*. Occasional Paper 53, National Bureau of Economic Research, New York 1954. The indexes of "gross" output (value of product sold in 1929 prices), net output (value added), and capital inputs (total assets) are based on data in Table 2 (p. 18). The labor-input index in an index of man hours worked by production and nonproduction workers and is calculated from data in Table 15 (p. 71), and from data (for 1929, 1937, 1948, and 1953) furnished by Creamer. The weights used to combine labor and capital inputs into an index of total net inputs are 48.6 for labor and 51.4 for capital. These weights were based on the average return to labor and capital in 1925-29 computed from data on value added by manufacturers and total wage and salary payments from *Historical Statistics of the United States, 1879-1945*, U. S. Bureau of the Census, Washington, 1949. Output data for 1953-55 is from the *Statistical Abstract of the United States, 1956*, U. S. Bureau of the Census, Washington, D. C., 1956, p. 792.

3. Mining: Indexes for 1890, 1919, 1929 and 1948 are based on data in Isreal Borenstein, *Capital and Output Trends in Mining Industries, 1870-1948*, Occasional Paper 45, National Bureau of Economic Research, Inc., 1954. The index of "gross" output (value of products sold in 1929 prices) is based on data in Table A-26 (p. 67); the data on "net" output (value added) is estimated from data in Tables 16 (p. 60) and A-4 (p. 70); the labor input indexes was derived from data presented in Table 3 (p. 20) by adjusting data on the number of hours worked by wage earners upward by the ratio of total employers to wage earners in order to obtain an index of hours worked by all employees; the capital-input index (exclusive of land) is based on data in Table A-4 (p. 70). Output data for 1953-55 is from the *Statistical Abstract of the United States, 1956*, U. S. Bureau of the Census, Washington, D. C., 1956, p. 732.

The decline in output per unit of total input in agriculture prior to 1919, reflected in a rise in prices paid to farmers and in prices paid by urban consumers during much of the 1899-1919 period, was undoubtedly an important factor behind the growing concern with the conservation problem. The rapid increases in output per unit of total input, reflected in growing "pressure of food supplies on population" in recent years, has probably been an important factor in placing the conservation drive on more rational economic footing.

The importance of labor-saving innovations, and the relative unimportance of capital-saving innovations prior to 1919, is no doubt at least a partial explanation of why the National Bureau, the Bureau of Labor Statistics and students of economic growth generally have tended to concentrate effort on measurement and analysis of labor productivity during the late 1930's and the 1940's and have only in recent years begun to examine the impact of technology on output per unit of capital and output per unit of total input.

#### *Interpretations of Capital-saving Innovations*

*What factors have been responsible for the emergence of capital-saving innovation on a substantial scale during the last four decades?*

I would like to examine three hypotheses to explain this shift in the character of technological change. The first two hypotheses seek an answer in terms of the limitation of the data. The third hypothesis looks to a fundamental shift in the pattern of innovation itself.

First, one might hypothesize that *the increased role that our analysis attributes to capital-saving innovation represents little more than the temporary impact of depression and war*. Kuznets, writing in the "Introduction" to Creamer's study of *Capital and Output Trends in Manufacturing Industries, 1880-1948*, points out that in the depression-dominated decade of the 1930's there would naturally be great pressure for economic use of capital and for a high ratio of replacement to gross capital formation with a consequent decline in the capital output ratio. And "in the 1940's the extraordinary pressure, first of World War II and then of demand for peacetime goods during the postwar years, would make for a high and intensive rate of use of existing capital stock and hence, for a low capital-output ratio again in 1948"<sup>12</sup>

The sharp decline in output per unit of capital input in agriculture since 1948 lends substance to this hypothesis. Kendrick has found a similar decline in output per unit of capital input since 1948 in the 33 major industry groups he is studying.

<sup>12</sup> Simon Kuznets, "Introduction" to Daniel Creamer, *Capital and Output Trends in Manufacturing Industries, 1880-1948*, Occasional Paper 41, National Bureau of Economic Research, Inc., 1956, p. 8.



The effects of depression and war have acted to bias the data and to emphasize the extent of capital-saving innovation. As Kuznets points out, however, this argument fails to explain the very significant rise in the capital-output ratio that occurred in some manufacturing industries even before World War I and occurred quite generally throughout private domestic economy between World War I and 1929.

*A second hypothesis is that the measure of capital input employed fails to provide an adequate measure of capital inputs.* In his paper on "Resource and Output Trends in the United States Since 1870," Abramovitz stated the following:

"On the side of capital, there is a chronic underestimate of investment and accumulated stock because, for purposes of measurement, we identify capital formation with the net increase of land, structures, durable equipment, commodity stocks and foreign claims. But underlying this conventional definition of investment is a more fundamental concept that is broader, namely, any use of resources which helps increase our output in future periods. And if we attempt to broaden the operational definition, then a number of additional categories of expenditures would have to be included, principally, those for health education, training and research."<sup>13</sup>

Again, one must grant considerable validity to this hypothesis. Any adequate measure of capital inputs in agriculture should for example, include the social capital invested in the several U. S. Department of Agriculture and Land Grant College Experiment Station research facilities.

It seems unlikely, however, that improvements in measurement techniques would entirely destroy what appears to be evidence of a positive shift in the importance of capital-saving innovations as compared to labor-saving innovations during the last four decades. Increases in capital inputs resulting from improved measurement techniques would probably be offset, at least in part, by measures of labor input that place greater emphasis on labor quality.<sup>14</sup> The growth in social capital and private capital invested in research and development efforts may however, by contributing to the growth of more systematic research and development activities, have been one of the factors stimulating the growth of capital-saving innovations.

My own hypothesis is that *at the industry level the relative importance of labor- and capital-saving innovations is related to the stage of the industries' growth relative to advances in the basic scientific and technical fields on which the technology of the industry is based.*<sup>15</sup>

<sup>13</sup> Moses Abramovitz, *Resource and Output Trends in the United States Since 1870*, Occasional Paper 52, National Bureau of Economic Research, 1956, pp. 12 and 13.

<sup>14</sup> T. W. Schultz, "Reflections on Agricultural Production, Output and Supply," *Journal of Farm Economics*, XXXVIII (Aug. 1956), pp. 756-760. Zvi Griliches, *op. cit.*

<sup>15</sup> For a somewhat similar hypotheses see Henry J. Burton, "Innovations and Equilibrium Growth," *The Economic Journal*, LXVI (Sept. 1956), pp. 465 and 466.



The first industrial or agricultural applications of basic scientific or technical advance tend to be primarily labor saving. After these basic advances have been translated into workable production processes and the technology becomes widely disseminated, the industry's technology becomes subject to continuous experimentation and improvement. During this stage increases in output per unit of capital input become an increasingly important component of the growth in output per unit of total input. This growth in the rate of capital-saving innovation stems from a dual foundation: *First*, the initial technical applications of the basic scientific advances are poorly engineered and are integrated into the total production system in a rather inefficient manner. Capital saving is thus a natural consequence of engineering and organizational refinements in the production processes. *Second*, as labor-saving innovations are introduced, capital inputs become a larger share of total inputs. This adds an economic as well as a technical basis for capital-saving innovations during the more mature stages of an industry's development.

I would like to emphasize the untested nature of the hypothesis. I do, however, believe that it is consistent with the history of at least three industries with which I am relatively familiar—the meat-packing, dairy, and fertilizer industries.

This still leaves unexplained why capital-saving innovation should appear simultaneously in broad sectors of the national economy. I believe that this gap can be bridged by tying the above hypotheses with respect to the sequence of labor- and capital-saving innovation into the Schumpeterian theory of economic growth.<sup>16</sup>

Schumpeter held that long waves of economic activity—which he identified as Kondratieff cycles—can be isolated and related to periods in which specific types of “innovation” were put into effect. Schumpeter identified a long wave extending from 1786 to 1842 related to a wave of innovations centered in cotton textiles, coal and iron, and in canals and road building. The spread of the steam engine was an important factor in this first wave. The second wave, from 1842 to 1898, was associated with railroad building and with steel; and a third wave, extending from 1898 to the present, is linked to the process of electrification, the internal combustion engine, and the chemical industries.

The data examined in this paper relate only to Schumpeter's third wave, a wave that may be nearing its end if Schumpeter's system is to be taken seriously.<sup>17</sup> This does not suggest that the pattern since 1919—in

<sup>16</sup> J. A. Schumpeter, “The Analyses of Economic Change,” *Review of Economics and Statistics*, May 1935; reprinted in *Readings in Business Cycle Theory* (American Economic Association), The Blakiston Company, Philadelphia, 1944, pp. 1-19.

<sup>17</sup> For a critical review of both the technical foundation and the economic rational behind Schumpeter's theory see Chapter 2, “Finding Trends and Cycles: Methods and Their Analytical Implications,” in William Fellner, *Trends and Cycles in Economic Activity*, Henry Holt, New York, 1956.

which capital-saving innovation has played an important role—will provide a reliable guide to the future. Indeed, considerable question is cast on the current practice of building long-run projections implicitly assuming a continuation of current patterns of technological change.

### DISCUSSION: AGRICULTURAL AND NONAGRICULTURAL GROWTH IN OUTPUT PER UNIT OF INPUT

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The introduction of Ruttan's paper contains a concise and very clear statement of the problems involved in trying to measure output per unit of input over a period of time. He lists the conditions for such comparisons to be valid. He concedes that these conditions are not fulfilled. Apparently on the assumption that an estimate is better than nothing he proceeds to calculate output/input ratios and finally draws inferences based on these highly speculative figures. He concludes with several alternative hypotheses as to why changes in the calculated output/input ratios might have occurred.

We are, of course, very much indebted to Ruttan for having prepared and brought these estimates together. These suggest that the net output per unit of labor and capital has increased only slightly less in agriculture than in manufacturing during the past 50 years. Even within the subperiods selected for study, the calculated average annual rates of gain in net output per unit of labor input in agriculture and manufacturing do not appear to differ materially. The rate of decline in output per unit of capital input in the period from 1899 to 1919 was less for agriculture than for manufacturing but the average annual rate of gain from 1919 to 1948 was also lower in agriculture than in manufacturing. These compensating differences in average rates of change in output per unit of capital input in the two subperiods account for the similarity in the averages covering the entire 54 year span.

The difficulties involved in preparing estimates of outputs and inputs, especially capital inputs, are formidable. The index numbers presented in Table 3 undoubtedly have been carefully prepared, but one can still find opportunities for raising questions regarding their composition and reliability. Unfortunately, the items included in the capital input index are not specified, and the criteria used to classify inputs are not discussed. Should automobiles, for example, be included in capital inputs? In most cases, they are more of a consumption item than a productive input. If they are included in farm capital inputs, perhaps they should also be included in inputs associated with nonfarm industries since they are as important in carrying on nonfarm businesses as they are in farming. Some

inputs that apparently have been excluded have as much justification for being considered as those actually included. A case could be made, as Mr. Ruttan suggests, for adding items commonly referred to as social overhead capital, such as roads and investments in research and education. Moreover, if one includes automobiles and barn cleaners and similar types of consumption items in farm inputs, why not include some types of household appliances? If an investment in kitchen appliances enables the farm housewife to spend more time doing farm chores, this may be more productive than some types of so-called farm expenditures, such as paint on the barn.

The nonhomogeneity of capital inputs creates special problems. How should one value inputs of land brought under cultivation in Montana between 1900 and 1920 in comparison with land abandoned in the Northeast during the same period? What index should be used to deflate non-real-estate capital-input values? Neither the prices of horses and harness nor the items of machinery and equipment used in 1900 or 1920 can serve as an accurate basis for adjusting current values of machinery. Two or three sprays using DDT and malathion or parathion are roughly equivalent in effectiveness to six or seven sprays using arsenate of lead, but prices of the former were unknown 20 years ago and the latter are no longer relevant. No amount of juggling of index numbers using base years, given years or some combination of weights for base and given years, will overcome the problem of comparing inputs of dissimilar items over a long period of time.

After examining the index numbers presented by Ruttan, one is left with the uneasy feeling that different investigators might come up with somewhat different estimates of changes in both outputs and inputs, or at least in the average rates of change for certain subperiods. For example, rough checking of changes in the area under cultivation and in the number of horses and mules and tractors on farms suggests that capital inputs increased little more than total output between 1900 and 1920. If this is true, the figure of  $-.5$  for the average annual rate of change in the ratio of output per unit of capital input for the period 1899-1919 is too low. Moreover, I find it difficult to accept the estimates of changes in capital inputs between 1919 and 1953. According to the figures presented in Table 3, total capital inputs increased slightly more between 1948 and 1953 (5 years) than in the entire 19-year period between 1919 and 1948. Furthermore, by shifting the dates of the subperiods selected for analysis one or two years forward or backward, one might come up with quite different estimates of gross and net changes in output. This would affect the output/input ratios for each of the subperiods. Output was six to seven per cent greater in 1920 than in 1919 and four per cent greater in 1955 than in 1953. Changes in output, of course, may be associated with

changes in capital inputs that occur several years earlier. Thus, average output/input ratios, especially for brief periods, may be significantly changed by shifting the beginning and ending years. I am not at all sure that re-calculating the index numbers using different inputs or time periods would lead to conclusions very much different from those presented by Ruttan; however, I am quite sure that a convincing case could be made for alternative rates of change in the output/input ratios during some of the subperiods.

My main concern, however, is not so much with the data as with the utility of trying to determine whether changes in output have been due to changes in technology, changes in the quantities of inputs employed or merely the substitution of one kind of input for another. Clearly we are now producing a somewhat different combination of products of different qualities using different kinds, qualities and quantities of inputs than were used fifty, twenty, ten or even five years ago. For most commodities we are not operating on the same production surface and certainly not on the same contour or with the same input combinations as in some preceding period. Changes in output are due to a complex combination of changes in scale, substitution (based on changes in price relationships), and the development of entirely new inputs and methods of combining inputs (new production surfaces). One cannot, in retrospect, sort out how much of the change was due to any one of these factors.

I am also in doubt as to what we expect to learn about the process of economic development by studying changes in average output/input ratios for particular industries. A large part of the increase in output per unit of labor input in agriculture, for example, has been induced or made possible by changes outside of agriculture. Because of technological developments occurring largely in nonfarm sectors of the economy, labor has become relatively expensive and machinery, fertilizer, tires and petroleum products have become relatively cheap. Farmers have responded to these changes by substituting the relatively cheap items for labor. The apparent changes in farm labor productivity are, to a large extent, simply a reflection or perhaps one could call it a by-product of changes in productivity in nonfarm industries.

Even if figures could be obtained that are an accurate measure of the changes in output per unit of input, I would still question the usefulness of conclusions drawn from them. Extrapolation of past trends occasionally will offer insights into the future, but trend projections also may lead one astray. Current problems in resource use including questions relating to the kinds and proportions of various factors to use in production still have to be solved by marginal analysis rather than by projecting trends.

## CREDIT IN A CHANGING AGRICULTURE

Chairman: Ivy W. Duggan, Trust Company of Georgia, Atlanta

### CREDIT NEEDED FOR AMERICAN AGRICULTURE AND ITS RELATION TO SURPLUSES

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INTEREST in credit as a tool to implement specific phases of national agricultural policy appears to have reached a new peak. The purpose of this presentation is to raise questions and consider problems relative to this increased interest and to state five hypotheses. A major part of this paper is addressed to the *relationship* between credit and the surplus problem. Reference is made to credit needs only to throw light on the *relationship* between credit and surplus.<sup>1</sup>

In large part, the assigned topic can be considered in terms of resource allocation within the framework of classical marginal concepts. The conceptual meaning could be retained and our thinking initiated on a common ground of the topic were amended to "The Relationship Between Credit and the Allocation of Resources with Particular Emphasis on Alleviating the Surplus Problem." Current interest in this general subject has emphasized selective restraint of credit to surplus enterprises on a national basis. It is assumed that this paper should relate to the current problem and leave discussion of credit to facilitate farm progress to the subsequent speaker.

#### *Credit Used to Allocate Resources Aside From Surplus Problem*

By examining the advantages and disadvantages of diverse ways whereby credit alters resource allocation in our imperfect capital market we will add perspective to the special application relative to alleviating the surplus problem. I shall discuss three general situations which have long existed. They illustrate diverse degrees of economic advantages and disadvantages.

1. Generally when a loan is made, someone or a group of persons makes a decision affecting resource allocation. Ideally, credit policy should be designed to facilitate the most efficient and socially desirable combination of human and physical resources.

A perfect capital market, however, is a concept—not a reality. From

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<sup>1</sup> "Credit" from the Commodity Credit Corporation will not be considered as credit in the same sense as the assigned topic implies. CCC transactions with farmers will be considered as cash farm receipts.



the credit standpoint, serious imperfections exist—incomplete knowledge, diverse selfish interests, imperfect competition, and the inertia of obsolete policies, to mention only a fraction of them. This paper is based on the obvious assumption that a perfect capital market does not exist and on the less obvious assumptions (1) that the imperfect capital market we have works better, in the long run, than any other known system; and (2) that we should continuously strive to detect and destroy imperfections in the system rather than destroy the heart of the system itself.

Fortunately, nonsubsidized lenders in a relatively free enterprise system have incentives to approach the concept of a perfect capital market. Rural lenders with a vested interest in their communities realize that the growth of their institution is closely related to the economic growth of the community. Also, lenders generally are very anxious to be assured of getting their money back. Lending to farm units which show most promise of returning a profit is the best assurance of loan repayment.

This general environment in which agricultural credit functions likely illustrates the most appropriate use of credit to allocate resources. Proposals to use credit for special purposes should be tested against the concept of a perfect capital market and the way (admittedly imperfect) nonsubsidized lenders tend to approach that goal.

2. Private businesses, such as farm equipment dealers, have used credit as a significant aid to sales. This has undoubtedly altered resource allocation. By highly developed credit procedures, some industries have committed farmers' purchasing power before others did and thereby obtained a larger share of the farmers' dollars.

There are disadvantages to such procedures. It might be argued that the adaptability of machinery to special credit arrangements has resulted in machinery investments with returns below those of alternative investments in productive items which were less adaptable to convenient credit arrangements.

Offsetting this possible misallocation of resources is the belief that recently developed procedures, such as machinery dealer-banker credit arrangements, resulted in larger farm profits in that they eased the flow of capital and facilitated the entry of additional resources into agriculture. These advantages to the economy as a whole are based on the assumption that agriculture is not a capital surplus industry relative to the remainder of the economy. This example of credit altering resource allocation illustrates certain disadvantages which were probably more than offset by advantages.

3. A frequent recommendation of various groups has been that credit agencies should improve their services to low-income, part-time, or young farmers. It has been implied that credit should be used to divert more

resources to all or a portion of the farmers in those groups. Proponents of this concerted effort have observed that limitations of capital unduly restrict the productivity and economic progress of these farmers. This is undoubtedly true in some cases, particularly where there are inadequate off-farm opportunities.

On the other hand, some would argue that an extremely limited supply of available physical resources, such as land—and not credit, is more often the major limiting factor.<sup>2</sup> A further weakness of the argument for more credit to low-income, part-time, or young farmers is that reference has seldom been made as to which specific farm or nonfarm group should bear the burden of restraint of credit necessary to divert additional productive resources to the select groups. However, such omissions are not without temperance or qualification. The Department of Agriculture has indicated that farm credit programs for low-income farmers should apply directly to only a fraction of them with an accompanying program of education designed to train a large fraction of them for more productive employment off the farm. Such qualifications notwithstanding, there is a disturbing tendency to omit considerations of alternative opportunities for limited human and physical resources and to assume that additional credit can be pulled into selected industries without compensating restrictions elsewhere. This illustrates weaknesses inherent in centralized credit planning.

#### *Previous Suggestions that Credit Be Used for Social Ends*

Observing other uses of credit to alter resource allocation, the proponents of the use of credit as an instrument of farm surplus policy may say that this is really nothing new and should be used for the desirable goal of alleviating surplus problems. E. C. Young presented a related idea when he wrote in the February 1941 *JOURNAL OF FARM ECONOMICS*:

"In principle the FCA should act (from the standpoint of national policy) to facilitate contraction at a time when contraction seemed desirable in the same manner the Federal Reserve System is supposed to function."<sup>3</sup>

In a more recent article, E. L. Butz wrote:

"In recent years a new emphasis has been placed on the function of agricultural credit. Many regard it as an instrument for furthering what they believe to be social progress."<sup>4</sup>

<sup>2</sup> L. L. Arnold, *Problems of Capital Accumulation in Getting Started Farming*, Station Bulletin 638, Purdue University, February 1957.

<sup>3</sup> E. C. Young, "The Function of Credit in Modern Agriculture," *Journal of Farm Economics*, February 1941, page 56.

<sup>4</sup> E. L. Butz, "Post-War Agricultural Credit—Problems and Suggested Adjustments," *Journal of Farm Economics*, May 1945, page 293.

Although Dr. Young and Dr. Butz raised serious questions about the use of credit as a tool of farm policy or some social end, its use was considered possible and was getting considerable attention. From the three general situations just cited, definite advantages of diverse types and magnitudes appear likely. The principle and the purpose of selective restraint of credit are simple—reduce credit, and consequently reduce resource inputs and production in enterprises in which there is a surplus. Maybe it has advantages. However, several limitations to selective restraint of credit warrant examination.

*Selective Restraint of Credit Incompatible with  
Basic Credit Function*

Attention to the basic function of credit reveals inconsistencies with centralized restraint of credit for selective enterprises. Agricultural credit, as with many other types of credit in a relatively free economy, is a mechanism which facilitates the combination of human and natural resources into farm units. Credit allocation is the act of impersonally bringing together savers and investors. Happily, the selfish interests of both parties tend to encourage each to act in a manner compatible with the long-run interests of the public at large. Institutional growth and debt repayment capacity were two reasons pointed out a few minutes ago. To be sure, imperfections do exist. To again emphasize the point, the imperfect system based in part on the compatibility between the incentives of enlightened selfishness and the mutual good of all people works better than any other system!

Credit based on a centralized decision that a surplus existed would greatly alter what was just mentioned as the best, although imperfect, system. For example, normal turnover of human and physical resources within a surplus industry would be seriously impaired. A person who showed promise of being extremely efficient and wanted to enter via the credit route could not do so under an effective environment of selective restraint of credit. Nor could an efficient operator use credit to expand. At the same time, a relatively inefficient operator would have less incentive to improve his efficiency or to seek more productive employment elsewhere. Long-run efficiency of agriculture in general would likely be reduced.

The basic function of credit to combine resources appropriately and the tendency of a relatively free system to carry out that function appears of great importance. The likelihood of altering and reducing the effectiveness of that basic function appears to be too high a price to pay for any possible advantages which might accrue from alleviating surplus problems.

*Selective Restraint of Credit Would Interfere with the Ability  
of Agriculture to Compete for Credit<sup>1</sup>*

The normal tendency of farm lenders is to allocate credit to farm units which show the most promise of a favorable return on the investment. It is important that an environment compatible with this tendency continue. Credit-financed capital from the money market will tend to flow to agriculture in relation to the return on contingent investments. Competition is keen for the limited volume of savers' dollars upon which the capital market is based. There are indications that a strong demand for limited savings will be maintained in the foreseeable future.

In addition to the generally competitive situation for capital in the form of credit, agriculture has been competing since 1951, for the most extensive period in the nation's recorded history, at a time when farm income has been unfavorable relative to nonfarm income. This relatively unfavorable position would seem to justify even more emphasis on profit as the criteria for farm investments. The allocation of credit by any other criteria, such as selective production controls, would reduce the over-all efficiency of agriculture and its ability to attract credit.

*Investments Under Surplus Conditions Can Yield Favorable Returns*

Many types of credit applied to surplus-producing industries appear desirable and profitable. Indeed, agriculture as a whole is a valid illustration. The recent land price boom in part reflects the urgent desire of individual farmers to attain a unit of sufficient size so as to produce more efficiently and make a profit. This has resulted in additional use of credit and more efficient-sized family farms.<sup>5</sup>

Certain investments in surplus farm enterprises have been desirable and profitable. Mechanization of cotton farming came about, in large part, during a period in which surpluses existed. The industry was called sick by many. If the price of cotton had been a little more free to fluctuate, credit-financed mechanization might have been at a more rapid rate and more complete by this time. The incentive to reduce per unit production costs would have been greater.

Credit for fertilizer inputs to surplus farm industries can be defended on somewhat the same basis as credit to mechanize cotton production. To the extent that fertilizer reduces per unit production costs, human and physical resources are made available for output of nonsurplus farm commodities or for nonfarm production. Many banks are actively engaged in a cooperative program with land-grant colleges and the National Plant Food Institute. This program is designed to encourage the

<sup>1</sup> Although this illustration involves largely a change of ownership and not an entry of new resources, it illustrates the point from a broad standpoint.

use of fertilizer where it will return a profit. I do not think bankers or other lenders deem it appropriate to make suggestions at the national level as to the surplus status of the enterprises to which credit-financed fertilizer applications should be made. Lenders at the local level may consider the surplus situation more closely—not to influence farm policy but as a consequence of existing policy or free market price, whichever prevails.

The broiler industry has been considered by many as surplus laden during recent years. Within the last two months, active steps were taken to restrict credit for new production facilities. Fortunately, this action was not effective. Had it been so, entry of superior management and improved production technology would have been impaired. Even if we assume there is a serious surplus of broilers, profitable investments can and should continue unabated by selective restraint of credit from a centralized agency.

*Is Any Centralized Group Sufficiently Knowledgeable to Decide on Whom or When Restraint of Credit Should be Imposed?*

Observing the growth of the broiler industry points up two questions relative to restraint of credit for surplus enterprises: (1) Who shall decide the persons on whom restraint of credit shall be imposed? (2) When is a commodity in a surplus condition which warrants restraint of credit?

In the recently proposed action in the broiler industry, there was reason to believe part of the motivating force came from the older broiler-producing areas. The question of "on whom shall restraint of credit be imposed" was not being based on either economic criteria or a social criteria of benefit to all the people. The realities of our democracy apparently are such that serious imperfections are bound to accompany centralized control such as restraint of credit.

There may be justifiable reservations as to the ability of any organized group, including agricultural economists, to ascertain the most propitious timing of restraint of credit. It is difficult to determine when production trends reveal more than a temporary surplus. For example, the broiler industry likely would not have developed to its present magnitude, nor would people be getting as good a buy on high quality protein as they now are, if the broiler industry had been sensitive to centralized government or centralized private influence. The growth of the broiler industry would have been cut short. It appeared to be a surplus industry long before production trends were reversed. Our economy is so dynamic and rapidly changing that it seems presumptuous to assume that centralized national control can be implemented as effectively as can localized action which is consciously or subconsciously attuned to marginal concepts of input-output relationships on an individual farm unit basis.



*Effectiveness of Restraint of Credit Limited by Decentralized Control*

Restraint of credit to so-called surplus industries likely could not be sufficiently effective because a large fraction of the farm credit in the United States is relatively free from restrictive impositions of the federal government or other centralized national control. The Farmers Home Administration accounted for less than 5 per cent of the total farm credit volume on January 1, 1957. Although the remaining 95 per cent is to some extent supervised as to general soundness or legal terms, it is allocated in large part with efficiency of farm units and the productivity and progress of the community as the principal criteria.

*Effectiveness Further Limited by High Equity, Flexibility of Capital Flow, and Diversification on Farms*

Even if restraint of credit from all agencies could be effectively imposed by national centralized groups, it would likely have no more than a very limited effect on resource allocation for several reasons: (1) Farmers have nearly a 90 per cent equity in United States agriculture. The 10 per cent of the physical resources contingent on credit would have to be very strategically located to provide an effective control device. (2) Even if credit were so located, the flow of capital is sufficiently flexible in the long run that new sources would be developed and diverted to units showing the most promise of profit. (3) The prevalence of both surplus and nonsurplus enterprises on individual farm units would further impede the effectiveness of restraint of credit on a selective enterprise basis. Proceeds of loans intended for a nonsurplus enterprise could, at the discretion of the borrower, be diverted indirectly to help finance a surplus enterprise.

Any hope for selective restraint of credit on diversified farms would have to be based on the assumption that loan purpose, as typically used, accurately describes the investment contingent on a specific loan. This assumption is subject to question. Loan purpose, as now frequently used, may more accurately describe a combination of physical resources considered to be good collateral and the items purchased at the season of the year when farmers have the least cash. It is little more than chance if that combination accurately coincides with the purchase actually contingent on a specific loan. To illustrate this point, machinery purchases are more often considered "loan purpose" than are fertility expenditures; and summer production and fall harvesting expenses are more often called "loan purpose" than are winter vacation trips. This phenomenon would limit the effectiveness of selective restraint of credit on diversified farms.

*Summary and Conclusions*

By its very nature, the use of credit either increases, decreases, or otherwise alters farm inputs and production. Credit as a tool to alleviate the surplus problem would involve a comparable function.

Examining the weakness and strength of various ways whereby credit alters resource use helps place the assigned topic in perspective. Cases can be cited in which the use of credit to alter farm investments appears desirable; e.g., the basic function of credit and drawing additional capital into agriculture via a convenient financing procedure. On the other hand, certain developments appear subject to question; e.g., concerted efforts to divert additional capital in the form of credit to special farm groups without due consideration as to who shall bear the burden of compensating restraint of credit. This appears to be the type of problem inherent in centralized decision making. It is somewhat comparable to reservations which appear valid relative to credit and the surplus problem.

Solutions to major aspects of the assigned topic are to be found primarily in logic, human reactions to various circumstances, and human incentives. Unfortunately, the refinement of statistical analysis lends itself poorly to the problem at hand. However, from our present vantage point, five hypotheses, or tentative conclusions, are stated for further study:

Selective restraint of credit is inconsistent with the basic function of credit; Selective restraint of credit would interfere with the ability of agriculture to compete for credit;

Specific investments in surplus enterprises are profitable and contribute to a sound farm economy;

No centralized group of persons can be knowledgeable enough to determine on whom restraint of credit should be imposed, or when a commodity is in sufficient surplus to justify restraint of credit; and

The potential effectiveness of restraint of credit is extremely limited by decentralized control of credit decision-making processes, high farm equity, flexibility of capital flow, and diversification on farms.

In conclusion, the use of credit to alter resource use in a manner compatible with alleviating the surplus problem has historical precedence and would have obvious advantages. However, inconsistencies between selective restraint of credit and economic and human factors associated with farm credit, and impediments to successful restraint of credit seem to tell us that credit should retain its basic function and not be directly used on a national, centralized basis as a tool to alleviate the surplus problem. In the process of performing this basic function, credit most advantageously alleviate problems associated with farm surpluses. The basic function of credit is positive and dynamic—not restrictive or repressive.

DISCUSSION: CREDIT NEEDED FOR AMERICAN AGRICULTURE  
AND ITS RELATION TO SURPLUSES

D. E. HATHAWAY

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Dr. Kreider has given us an interesting paper approached as he said "within the framework of classical marginal concepts." Within this framework he has examined the possibility of the use of selective credit restraints by some "centralized" authority to reduce inputs in agriculture and thereby reduce output and surpluses. He has concluded that selective credit restraints would not be desirable to achieve this end. I tend to agree generally with his conclusions on this topic, but for somewhat different reasons.

If there were time I should like to disagree somewhat with Kreider on the use of selective credit control by a centralized authority vs. "enlightened selfishness." To do so, however, I would prefer to deal with the entire economy rather than with the agricultural sector alone. In passing, I would mention that enlightened selfishness led to the World War I speculative land boom, which ultimately collapsed and in retrospect appeared not to have been in the interest of either farmers or banks. A number of other value-loaded statements appear which profess that individual are wiser than economists, central bankers, and others. I personally doubt the possibility of empirical verification of these statements, but to question them further would take me from the major objective of my comments.

The major reason that selective credit controls would not reduce agricultural output is that since about 1920 credit has provided a very minor portion of the new capital in agriculture. A basic distinction in types of credit of major importance to our discussion was omitted by Kreider, or at least underemphasized. Credit supplied to transfer the ownership of existing capital assets is different from credit that provides for new capital formation in agriculture. Net capital formation changes the capital-labor ratio, productivity, and incomes within agriculture. Most of the credit currently supplied American agriculture is used to facilitate the transfer of ownership of existing capital, whereas most of the new capital formation in agriculture has been from farm income. As a result, there was essentially no net capital formation in agriculture during the period 1920-1935. Since that time there has been a resumption of new capital formation in agriculture, but the role of credit agencies, either public or private, has been sharply reduced. Since 1920 new capital formation has been largely dependent on internal sources, i.e., gross farm income.<sup>1</sup>

<sup>1</sup> For verification of these facts see Chapter VIII, *Capital Formation and Financ-*

With the decline in agricultural income in recent years, the suggestion is that the rate of real capital formation in agriculture has been sharply reduced in the last two or three years.

With this background in mind, I would like to reformulate the relation of credit to surpluses. First, surpluses are only visible manifestations of the real economic problem in agriculture. As such, I must attempt a definition the previous paper requested but doubted possible. Agricultural surpluses arise when the income to agriculture is lower than is politically acceptable to producers. Historically in such a situation producers attempted to improve their incomes by imposing government price programs at levels higher than would otherwise exist, thereby leaving a portion of the supply not taken by the commercial market. This is the surplus.

Such an unacceptable income exists when the supply of farm products is such that it returns a price so that the marginal value product of the factors used in its production is less than the marginal value product of these factors would be if used to produce another product. Unacceptable incomes might also occur even if the marginal value product of inputs in agriculture were equaled to those in the nonfarm economy, merely because farm operators own too few income producing assets. Indications are that on most commercial farms today the m.v.p. of labor is below its value in alternative occupations. There are two ways in which the m.v.p. of labor may be increased. One is by reducing the input of labor, thus effecting a recombination of resources. This of course assumes that most commercial farms are not organized efficiently given the current state of technology. The other way of increasing the m.v.p. of labor in agriculture is by the introduction of new technology. The kind of technology needed is hard to define and more difficult to visualize. Ideally, it should increase the m.v.p. of labor without increasing output. Practically, if it increases the marginal physical productivity of labor without increasing output at a more rapid rate than the demand for farm products expands due to increasing population and incomes, it should increase the marginal value product and income of labor in agriculture. Even if the new technology increases output, if the demand for the product is sufficiently elastic so that not all of the gain in marginal physical product is more than offset by falling prices, there will still be an increase in marginal value product of labor.

Both solutions tend to have two requirements in common, assuming no unexpected increase in the demand for farm products. First, they require a continuing reduction in labor employed in agriculture. Of more direct relevance to the subject under discussion, however, is the likelihood

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*ing in Agriculture, 1870-1950*, by Alvin S. Tostlebee, published as a report of the National Bureau of Economic Research, Princeton University Press, 1957.

that both would require substantial increase in capital employed in agriculture.

Therefore, it appears to me that the relevant question for discussion is not whether capital investment in agriculture can be restricted enough to reduce production increase prices, and thereby incomes, *but whether our current financial institutions are capable of financing the specific kinds of technological innovations necessary to increase the return to labor on well-organized farms to levels comparable to the nonfarm economy.* I would like to suggest that neither the public or private financial institutions serving agriculture are currently capable of providing this capital.

Most of the technology that fits the criteria of increasing labor productivity probably falls under what is loosely classified as intermediate-term investments. The Federal Reserve survey of farm loans by commercial banks on June 30, 1956 found that only 8 per cent of the loans for purchases of machinery and equipment and less than one-half of the loans for improvement of land and buildings carried maturities of more than two years. I think it is of major importance that the extreme specialization of the broiler industry, which has apparently resulted in substantial increases in the productivity of the labor involved, has come through vertical integration with the feed manufacturing and processing industries. Thus, the additional capital necessary to change the industry has come from industries with access to corporate financial institutions not commonly used by agriculture. I am not certain that this particular type of development is desirable, insofar as it results in part in the managerial process largely resting with those that provide capital.

I have no solutions to offer as to how the institutional arrangements surrounding the provision of additional capital to agriculture should be altered. I believe this is currently one of the most neglected phases of research in agricultural economics. If such research is not done it appears probable that the structure of American agriculture will undergo changes that will violate many of the values most of us hold regarding a desirable structure in the industry. In addition, private financial institutions, now serving agriculture, may have missed vast opportunities for profitable investment. Thus, I am disappointed that our speaker representing these institutions has not dealt more fully with what I consider to be the major problem under the topic of "Credit In a Changing Agriculture."



## THE ROLE OF INTERMEDIATE CREDIT IN A CHANGING AGRICULTURE

ROBERT DARR

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Columbia, South Carolina*

SOME of my remarks will be based on available statistics, some on my knowledge of farming operations financed by our production credit associations and the credit bank during my 24 years experience, and I shall also express some ideas and views on the subject about which I believe there is more to be learned than is known at this time.

### *What Is Intermediate Credit?*

I suggest that we think of intermediate credit as credit for capital investments and/or to refinance debts incurred for capital purposes to be repaid over a period of 2 to 5-or-more years. The purpose of credit and the length of years for repayment prescribes intermediate credit rather than the type of collateral or procedures followed in preparing the loan papers. The security may be either a crop and chattel mortgage or real estate, or both. Specifically, intermediate credit in our system includes funds to purchase or to pay debts incurred for the purchase of machinery, equipment, automobiles, trucks, breeding stock, dairy cattle, remodeling and construction of buildings, for pasture development and improvement, fencing, soil and water conservation, to establish citrus groves, and for other purchases to add to the capital assets of the borrower as contrasted with financing annual operating expenses or long-term real estate debts.

### *Large Capital Requirements in Agriculture*

Agriculture, as well as other sectors of our economy, is using an ever increasing amount of capital, and capital usually means credit. A few figures indicate the increased efficiency of farmers and their use of capital credit: In 1930 each farm worker raised enough food and fiber for himself and 9 other people—now he produces enough for 20 people. Capital invested per farm worker averages about \$16,000 compared with less than \$5,000 in 1930—up more than 3 times. Total acreage per commercial farm has increased 41% in the past 15 years (it required capital to do this). In 1920 we had 32,000,000 people on farms, representing 35% of the population. In 1956 we had 22,000,000 people on farms or 13% of the population. We have 4.8 million farm units in the United States. Less than 2 million are what we call commercial family farms and the remainder are part-time or subsistence farms that contribute a small percentage of total production. Today, about 65¢ of each dollar the farmer

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<sup>1</sup> The

receives is spent for goods and services required in his business (this also requires capital).

### *Changes in Total Farm Assets and Debts*

The total dollar amount of assets of farms increased from \$54 billion in 1940 and \$95 billion in 1945 to \$170 billion in 1956. A little over half of this increase represents price changes, or inflation. The remainder of the increase represents very substantial physical improvements on real estate and increases in machinery, equipment, and other types of physical assets. For example, value of farm machinery per farm increased from \$1,017 in 1948 to \$2,939 in 1956. Value of all productive assets per farm increased from \$16,127 in 1948 to \$25,490 in 1956.<sup>1</sup> These additional dollars of assets have been financed in part by expansion of debt. The debt secured by mortgages on farm real estate declined during World War II, reaching a low point in 1946. Since that time it has just about doubled. The short-term debt likewise declined during the War but since its low point in 1945, has more than doubled. Even after these increases in the debt, it appears that farmers as a whole have very substantial equities in their farms and in livestock and equipment, and the increases in capital used have been accomplished without correspondingly large total debt accumulation.

### *Federal Intermediate Credit Banks and Production Credit Associations*

As you know, the 12 federal intermediate credit banks were created to meet an increasing demand and a great need for a permanent source of short-term credit which came with the advent of technology in agriculture. The Agricultural Credits Act of 1923 was passed by Congress in an attempt to provide a wholesale source of funds for short-term farm credit agencies, including commercial banks. The 12 federal intermediate credit banks were set up under this act to discount the agricultural loan paper of commercial banks, agricultural credit corporations, and other financing institutions which made loans to farmers. However, the credit banks fell far short of their objectives in providing credit for farmers, primarily because there were not enough financially strong local institutions through which individual farmers could reach the credit offered by the credit banks.

The production credit system was established under the Farm Credit Act of 1933 to bridge this gap between credit banks and farmers. The Farm Credit Act of 1933 created 12 production credit corporations which had the responsibility to organize PCAs, furnish the necessary capital, and to supervise the PCAs. There are now 497 PCAs serving farmers in

<sup>1</sup> *The Balance Sheet of Agriculture 1956*—Table 16. USDA.

every county in the nation. In 1956 the associations made 276,000 loans, totalling about \$1½ billion and a substantial amount of this was intermediate capital credit. We have 87 associations in our district with approximately 88,000 members, and loans will total approximately \$130,000,000 this year in Florida, Georgia, South Carolina, and North Carolina.

Effective January 1, 1957, production credit corporations were merged with the federal intermediate credit banks in the interest of efficiency and economy. All of their powers and supervisory duties over the PCAs are vested in the credit banks.

The Farm Credit Act of 1956 provided the authority by which the credit banks will ultimately be owned by the production credit associations which are farmer cooperative organizations. Under the provisions of the Act, the government's investment in the banks will gradually be retired as stock ownership in the bank by production credit associations increases. The production credit associations subscribed for about 15% of the capital in the credit banks and they paid approximately 5% January 1, 1957, and will pay another 5% January 1, 1958, and 5% again January 1, 1959. The remaining government capital will be retired from future earnings of the credit banks and patronage refunds will be made to the PCAs in the form of additional class B stock, and participation certificates to other financing institutions will be issued, in proportion to the interest paid by the users of the credit banks and these funds will be used to retire government capital. The first repayment of government capital in the amount of \$415,000 has already been made by our credit bank.

The Farm Credit Act of 1956 also broadened the lending authority of PCAs and authorized the credit bank to discount notes for capital purposes with maturities up to 5 years, thus improving the intermediate credit service needed by modern agriculture to fill more adequately the gap between short and long-term credit. These changes have made the PCAs and credit banks of greater use to farmers. In our district we have approximately \$10,000,000 outstanding in intermediate loans, with maturities ranging from 2 to 5 years and a substantially larger amount of capital credit evidenced by 12-month renewable notes which will be repaid within 5 years.

The 87 PCAs in our district began operations in late 1933 and early 1934 with government capital, and the demand for credit was great because of the depressed economic conditions and the unavailability of credit. Since organization, the associations in our district have loaned \$1½ billion dollars. Each borrower becomes a voting member and buys \$5 stock for each \$100 borrowed. The stockholders elect their directors

who employ the secretary-treasurer and personnel, and 2 of the directors and the secretary-treasurer serve as a loan committee. The directors direct the affairs under the general supervision of the FICB and within the framework of general policies prescribed by the FCA for the good of both borrowers and the associations. The 87 PCAs in our district have approximately 88,000 members who have invested capital of \$11,156,340 and surplus of \$14,372,626—a total net worth of \$25,528, 966. All government capital in the associations of our district was returned on January 1, 1955 and the associations are in good condition to serve farmers. The progress of PCAs in our district has been exceeded by PCAs in some other sections of the country, but the progress made by the system has been good and is evidence of the need for and the soundness of our credit system.

The credit bank operates under the direction of the Farm Credit Board of Columbia, subject to the supervision of the Farm Credit Administration. Our bank has a capital of \$8,526,855 and a surplus of \$3,706,963—total of \$12,269,818. The 12 FICBs issue consolidated debentures with maturities not to exceed 5 years, usually 6 to 9 months. We go into the money market each month to obtain the necessary loanable funds and pay the going price for money. Our debentures are not government guaranteed, but our rate is good because of the combined financial resources of the 12 FICBs and their good record for 34 years.

Our system has pioneered in many fields of short-term and intermediate credit: the budgeted loan feature with money being advanced as needed and repaid as crops or livestock are sold, with interest charged on the outstanding balance for the actual number of days used, and loans on the basis of repayment capacity and the amount needed to do a good job instead of strictly collateral lending. I believe that thousands of farmers would tell you that our policies, plans, and procedures, and the administration of credit point the way of good farm and money management, which has helped them make progress.

We have pioneered in capital purpose credit with maturities up to 5 years, after having experimented with loan maturities up to 3 years. Julian Atkinson made a study of 200 farm owners in the Southern Piedmont who had been financed by PCAs continually from 1946 to 1951, inclusive. Some of these were cotton farms that used relatively little credit for capital purposes. Some were livestock farms that used substantially more investment credit. Some were changing from cotton farming to livestock farming during the period of the study and in making that adjustment greatly increased the amount of credit they were using for capital purposes. Those who were livestock farmers and who made maximum use of credit and particularly credit for capital purposes had

the largest increases in net worth during the period. Those who shifted to livestock farming or to a combination of livestock and crops and who also used a substantial amount of credit for capital purposes made the next largest increase in net worth. Cotton farmers who did not change their type of farming had the smallest increases in net worth.<sup>2</sup>

According to a report by the Research and Information Division, FCA, (Bulletin CR-8) "PCA Members and their Loans," 32.4% of intermediate term loans were for the purpose of improving farm land and buildings; 24.7% to purchase real estate; 28.7% for irrigation equipment and wells; 13.3% for purchases of machinery, automobiles, trucks, and equipment; and .9% to pay debts.

Our system is trying to lead the way in constructive short-term and intermediate-term, financing of agriculture. We don't have all the answers but we are making progress.

### *Possible Future Use of Intermediate Term Credit*

In the light of history, present agriculture and economic conditions and the trends now apparent, it is my opinion that farmers will need and use a larger amount of capital credit within the next few years because operating costs are high, leaving small net earnings, if any, to invest in capital needs. Further adjustments and shifts will likely be made, requiring capital. Some small farms will likely enlarge the size of their operations, which will increase use of both intermediate and long term credit, such as provided by the Federal land banks. Many young farmers will likely desire to obtain credit to establish or expand their operations. Machines will continue to replace man labor in the interests of efficiency and increased earnings on our commercial farms. There is a strong economic incentive to borrow capital credit instead of using merchant or dealer credit. For example: In financing farm equipment, the large majority of equipment companies will give a 5%, or greater, cash discount for a cash purchase. This discount is seldom available if their finance plan is used.

I am advised by a reliable farm equipment dealer that his company uses an interest rate of approximately 9% and that the majority of farm equipment dealer plans approximate this figure. The rate of interest charged by PCAs in our district at this time varies from 6% to 7% on the outstanding balance for the actual number of days used. The member is also required to pay a loan service fee to cover the expense of making his loan. A farmer who buys a piece of equipment worth \$2,000 and finances it with the dealer with a down payment of \$670 and the balance

<sup>2</sup> *Financing Farm Adjustments in the Southern Piedmont*, Bulletin CR-7, Research and Information Division, FCA.

of \$1330 amount and obtained the first plus \$13 to be b 2 annual less than stock value can sell (The in

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of \$1330 in 2 annual payments, would result in total financing or payments amounting to \$1,514.15. A similar farmer who financed through his PCA and obtained the dealer discount of 5% would have a savings of \$100. Like the first man, he uses \$670 of his money in the transaction, leaving \$1,230 plus \$15.75 loan service fees, and \$70 for PCA stock or a total of \$1,315.75 to be borrowed from the PCA. Like the first man, he repays the loan in 2 annual installments, resulting in total payments of \$1,434.17 or \$79.98 less than the first fellow paid through dealer financing. He has his PCA stock valued at \$70 which he can keep and use for future financing or he can sell it. In either event he has saved \$149.98 through PCA financing. (The interest rate in this case was 6% per annum.)

### *Sound Principles for Lenders*

1. Lenders should make a loan suited to the farmer's needs and operations, if his plan is sound. If it isn't sound, we need to explain why we can't make the loan. Sometimes lenders can render a greater service not to make a loan. It must be sound for the borrower as well as safe for the lender.

2. Lenders must be able to evaluate the applicant, his ability to manage money, as well as farm management, his know-how, and the potentials of his capital expansion program.

3. Lenders must be willing to lend an adequate amount to do the job, for a sufficient period of time to enable repayment with some flexibility for bad years due to uncontrollable factors.

4. Lenders must have adequate capital and access to adequate loanable funds. We in the credit banks, the federal land banks, and the banks for cooperatives feel that we can measure up to this one, but the cost of money in the money market presents us some real challenges.

### *Sound Principles for Borrowers*

1. Borrowers should be able to present to a lender a complete plan of operation, estimated costs, and how the money is to be repaid. In my opinion, there is no good risk who can't get the money he needs, even during this period of tight money, if he is dependable and has a sound plan. One banker put it this way: "When your credit man says 'no', one of two things is wrong, either the applicant has not sold himself and his program, or else the risk is too great." If the risk is too great, the farmer should not obtain the loan. Perhaps the borrower should ask the question, "Do you think I can afford to borrow this money?" Rather than, "Can I obtain the loan." I believe that financial planning and credit arrangements should be made to conform to a farmer's operations, and then the borrower should conduct his operations to conform, to the maximum

extent possible, to the financing plans which have been made. A farmer gets into trouble starting his farming operations or capital expansion program without adequate credit arrangements to see it through.

2. Repayment capacity is a major consideration in extending intermediate credit. Will the loan increase net income to enable repayment of the loan? It is important that borrowers follow their repayment plan whether it is from livestock sales or crop sales.

3. Borrowers who get into difficulty should immediately let their creditor know their problem, so that the lender can give any suggestions and help possible.

4. A borrower should have confidence in his ability to carry out his program, and he should have sufficient financial backing to weather reasonable reverses due to unfavorable weather and price fluctuations. Will his family stick with him under difficult circumstances to work out the debt?

5. Credit should be used as a tool, and a farmer should not get involved to the point where credit becomes a master. Does my credit work for me or do I work for it?

6. Borrowers should not borrow from Tom, Dick, and Harry. Too many creditors, who all want their money at once, can be as discouraging and disastrous as too large a debt in relation to the repayment capacity of the business. It pays to borrow from a creditor who understands the business and who is able and willing to stay with the borrower as long as he acts in good faith.

7. Farmers can get into trouble by not having a proper balance between short, intermediate, and long-term credit. No fixed formula can be applied to every case. If a borrower needs long-term credit, we refer him to the FLB or to other long-term lenders so that he will have a long enough time to repay without getting into a squeeze or having his operations crippled. The best time to pay a debt is when we have the money. Therefore, money that can be repaid annually or within 5 years should be paid without postponement and running the risk of snowballing financial trouble in the future.

8. Borrowers should lay their cards on the table and be leaders in cooperation with and between their long and short-term lenders.

### *The Future Presents Great Opportunities*

May I enlist your help in carrying on additional research on how much capital credit can be used by various types of farmers, how fast can it be profitably used and how can it be repaid. My belief is that more people should have training in how to use credit wisely and we need men trained in how to finance agriculture. If you will devise plans to train men in how to administer credit wisely for the good of the

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borrower as well as the lender, it will help farmers, because commercial banks as well as our farm credit banks and associations are looking for men who can do this job.

May I also suggest that more research and information is needed, in a form so that it can be used effectively by farmers, by farm management representatives, extension and credit officials, on the wise use of capital credit. The ultimate potential of capital credit depends on the farmers desire to expand capital investments, his ability to carry through successfully and eventually repay the loan, and have a more profitable business. Credit in any form, whether short, intermediate or long term, is not a substitute for good management. Good management, I believe, is somewhat of a process. I am of the opinion that lenders are willing to go with farmers who show promise of success.

#### DISCUSSION: THE ROLE OF INTERMEDIATE CREDIT IN A CHANGING AGRICULTURE

J. H. ATKINSON

*Purdue University*

Much of Mr. Darr's paper applies to farm credit in general and is not uniquely related to intermediate credit. My first reaction was that this was a major weakness in his paper. But upon further reflection, we must conclude that the fundamentals of borrowing and lending are the same, regardless of the type of credit involved. Thus, a major contribution of his paper should be to emphasize the fact that fundamentals applicable to intermediate credit differ only in degree from fundamentals applicable to other kinds of credit. For example, risk is a consideration in the use and extension of any kind of credit but probably is much more important in dealing with intermediate than with short-term credit.

At least two factors bear on the increased importance of risk as related to intermediate credit. First, risk tends to increase as the time period increases. The increased risk associated with long-term loans tends to be offset, especially from a collateral viewpoint, by the limited extent to which land is subject to physical depreciation. No such offsetting effect is found in the use of intermediate credit used to finance capital goods subject to physical depreciation and obsolescence. Second, and perhaps more important, changing technology, which has given rise to much of our increased need for intermediate credit, tends to involve much greater risk than the "tried and proved" methods of production. Risk related to new technology arises (a) from lack of existing knowledge, and (b) from failure of either lender or borrower to obtain known

facts. There is little practical difference in the effects of risk arising from either of these sources. Thus, alert, well informed lenders are necessary for extension of much of the needed intermediate credit.

Although I appreciate the importance of well informed lenders, I would not like to see lenders who consider themselves so well informed that they tend to stifle the ingenuity and initiative often successfully used by American farmers to improve production efficiency. Thus, I cannot agree with Darr that a loan ". . . must be sound for the borrower as well as safe for the lender." American agriculture must have risk capital to continue progress in improving efficiency of production. Some of this capital undoubtedly will come in the form of loans that may be relatively safe but the soundness of which is an unknown factor. And so long as lenders include in the interest rate a charge for risk of loss, it seems reasonable to expect them to bear some risk.

I suggest that we need to give increasing attention to means whereby farmers can bid effectively for intermediate credit to finance changes in farm production which often involve relatively high degrees of risk. Historically, farmers have found ways to bid for credit in spite of lending institutions as evidenced by intergration in the poultry industry, dealer and manufacturer financing of farm machinery, the use of merchant credit and the use of leasing arrangements. Judged by institutional interest rates, farmers paid handsomely for the above credit and financing services. But considering the risk involved and the results obtained, who is to say that they paid too much? These sources of financing will continue to be used by farmers who will continue to pay "high" interest charges. But could not existing credit agencies introduce more flexibility in allowing farmers to bid for intermediate credit which often is characterized by a high degree of risk? Although it is encouraging to note recent progress of the Production Credit System and banks in recognizing the need for an extension of intermediate credit, much additional progress could be made.

Darr's discussion of increasing capital used in agriculture was also general in nature. In many areas, the farm asset structure has changed materially with intermediate assets becoming relatively more important. This is especially noticeable in the Southeast where farm organization has shifted from row crops to livestock. But examination of asset structure does not tell the entire story. Much of the increased capital required for land has been the result of price increase. Since individuals who sell land are a major source of long-term credit, problems of financing in this area are not as acute as in the short-term and intermediate-term area where much of the increased capital needs are represented by addition of physical capital goods.

Darr's definition of intermediate credit, "... as credit for capital investments . . . which is to be repaid over a period of 2 to 5 or more years," is a good one. I should like to emphasize the criterion of repayment period in defining intermediate credit. Obviously, many assets with a useful life in excess of one year have been financed successfully with 6 to 12 month loans. Farmers' equities and total earning capacity have made this possible. I cannot agree with the notion that the term of credit must always coincide with the length of productive life of the new asset. This concept probably stems from commodity, enterprise, piecemeal financing, of which agriculture has had much, and from confusion of farm management and financing decisions. Certainly, in farm management all the "pieces" should be examined, but once the farm is organized into a unit, financing should be based on productivity of the entire unit.

A plea was made by Mr. Darr for additional research to aid in deciding how much and what kinds of credit to use. I can also envision fruitful results from efforts of researchers who could move outside the existing framework of custom, financial law, institutions and practices, to investigate alternative ways of financing agriculture. What are the consequences of corporate family farms, of larger corporate operations, of integration, of changes in present credit agencies and what should be the role of government in the farm credit field? Although much of our research must, of necessity, deal with small segments of the larger problem of financing American agriculture, we must not lose sight of the setting in which we find these segments.



## AN EVALUATION OF MARKETING RESEARCH AND EXTENSION

Chairman: C. B. Ratchford, North Carolina State College

### A CRITICAL EVALUATION OF AGRICULTURAL MARKETING RESEARCH

R. L. KOHLS

*Purdue University\**

THE EXPANDED research program in marketing initiated by the Congress after World War II has now, for all practical purposes completed its first decade. How has it fared? Has it resulted in a good return on the public's invested dollar? I do not propose to enter into the ridiculous game of "estimating benefits to the public (in dollars if possible)" each of us must play as we close out one of our projects. This may be necessary fuel for administrators in seeking appropriations. And since this is the principle use of such efforts, my advice is that we do not be too conservative in our estimates. Our fellow production scientists certainly aren't bashful in their claims.

The subject of the entire 1956 National Marketing Workshop was the use, appraisal and prospect of marketing research. Within the pages of the report of this workshop are some highly interesting efforts of Messrs. Fox, Bressler, and others to develop analytical frameworks for evaluation. In addition, this evaluation and criticism problem has been tackled almost annually by members of this association. No matter how elaborate the framework, the results will always be highly personal and somewhat analagous to the mouse's description of the elephant. Therefore, from my personal viewpoint, I believe that the investment in marketing research has and will continue to pay off handsomely.

Labor efficiency has increased in marketing. Products have improved in quality. Waste and spoilage have been reduced. Marketing services and agencies have improved. Someone has said (and I agree) that the development and perfection of the supermarket probably has had more real economic impact than many of our other more advertised and more spectacular products of science. Did marketing research contribute to these developments? In general, they are the result of a dynamic, exploring and experimenting marketing machinery. Such an attitude on the part of the marketing agencies of our country is a refreshing and relatively new attitude. Many forces abroad during the last 10 years might have in-

\* Particular appreciation is expressed to my colleagues, Professors P. L. Farris and V. W. Ruttan for their many helpful suggestions. Indiana Experiment Station Journal Paper 1153.

fluenced this attitude. One of these forces has been an expanded and revitalized marketing research—both public and private. I, for one, am willing to attribute part of these improvements to it.

With that said, I plan to attack the job of evaluation in two major parts. First, I will lay out what seem to me to be some important broad observations about us as researchers and our research efforts. Second, I will give my personal evaluation of our progress in specific lines of research. In doing both, I propose not to refer to many specific research projects or efforts. Each of us can fill in the specific examples from our own experience and background.

### *Observations of Marketing Research and Researchers*

#### *Concerning research personnel*

*The quality and equipment of the personnel engaged in marketing research has improved markedly.* Most of our colleagues writing immediately after World War II deplored the scarcity of trained workers in activating the expanded marketing program. They were right. To fill the gap many were recruited from other fields of training and frantically set about to "re-tread" themselves for this new effort. Now after 10 years, this self-training process and the graduate programs of our universities are sending men into the research battle with far superior training—both in research know-how and in their concepts of the workings and problems of the marketing arena.

In passing, I should like to mention the contributions of the National Marketing Workshops and to lament their apparent death. Starting with the 1949 venture through the final one of 1956, these workshops performed a real function of bringing together interested workers and stimulating them to self-improvement. I believe the trend in the last few years of including a vast array of people not primarily interested in doing research detracted from their effectiveness. Be that as it may, the killing of these training sessions, I believe, will prove to be a short-sighted and costly mistake.

It has been good sport to take pot-shots at the efforts of the regional research committees. Without saying anything about the quality of such research itself, the regional efforts have certainly contributed to the development and stimulation of research personnel. These meetings have aided in over-coming the tendency many of us to become narrow and provincial in our viewpoints. And to a marketing research man, provincialism is one of his most costly sins.

#### *Concerning the handling of research results*

*The research literature of marketing which was a mere trickle a few years ago has mounted to near-flood proportions—and will increase yet*

further. This has been the product not only of the agricultural experiment stations and federal agencies, but also of the business and marketing divisions of our colleges and the ever-growing array of commercial marketing research firms. The mere "keeping-up" has reached the proportions of a major task. But keep up we must if we are to move forward. Increasingly, I am convinced that the cry of "we have no data or research" often means that we have not looked.

The problem of keeping abreast of research in the individual states is particularly difficult. I suspect that most of us in the states are better informed about federal activities than we are about each other's activities. Most of us receive the announcements of federal publications. But how many of us receive any sort of regular announcement of the publications of the states? In this respect the bibliography work of some of the federal agencies has been very helpful.

Most of our departments will have to give increased emphasis and support to their departmental library facilities. The desirability of having the counterpart of the "literature searchers" of chemistry and physics will need serious consideration. Also, our own *Journal of Farm Economics* needs to give the question of its services to the marketing area serious and continued attention. From many viewpoints it falls far short of the services rendered by the *Journal* of our other association—the American Marketing Association.

*As economists we are very wasteful in the sense that we make little use of what has been done before.* We are great advocates of the "do-it-yourself" school. Part of this is a result of the problem just discussed. We cannot—or do not—acquaint ourselves with previous efforts. But part of this philosophy is an outgrowth of an unfortunate and disturbing fact. Many of our findings won't add together even if we know them. A recent study attempted to pull together the findings of all of the various consumer preference studies for many products. It was hoped to be able to make some generalizations concerning the relative importance of factors influencing consumer choices. The results were inconclusive and disappointing for two major reasons. First, the terminology used in the various studies was so different that "addition" was very difficult. Secondly, and probably of more importance, there was evidence that the findings of the studies differed according to the type of agency sponsoring them—experiment station findings differed from the findings of private agencies. Both of these represent serious charges against the scientific method of our profession. The plea, often made before, for some standardization of terminology still is valid. In any case, the fact that we do not—or cannot—use previous work to build on is a serious handicap to our progress.

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*The channels of written communication are not adequately explored.* Early in the postwar burst of marketing activity we were admonished to broaden our vision. Marketing included the vast, heterogeneous area lying between the farm gate and the consumer. Our habits, training and biases led us to putter around the farm gate and first-sale agencies, and to leave the vast area of processing, wholesaling, retailing, and consumer economics alone. However, after ten years, I think it can be asserted that our vision and activities have broadened. We *are* dealing with processors, wholesalers, and retailers and their problems as even a hasty review of our reports will show. We have even recently jumped (or perhaps we were pushed) headlong in the problem of consumer economics.

To the best of my knowledge, however, we are still largely using experiment station and U.S.D.A. bulletins and leaflets as our main source of communication. I grant that these have improved in readability through the use of color, cartoons, pictures, etc. And they might be quite adequate if those whom we were trying to reach were ourselves or farmers who have been acclimated to these sources. But much of our information is now supposedly of value to retailers, processors, handlers etc. These groups have their own professional press in the form of trade magazines. The response to the research information placed in the right communications channel is often-times amazing. The editor of these magazines are usually very interested in being permitted to publish our findings. Often they will provide ample supplies of reprints for distribution by the researcher or his experiment station. Research usefulness is directly tied to getting it into the hands of those who can use it. Increasingly, we must recognize the legitimacy of these other outlets for our information.

*There is criticism that many of the results of marketing research are made available too late to be of use.* All of us can probably supply our own examples of instances in which this criticism is justified. Some, in discussing this have laid the cause at the door of personnel problems, graduate students, overworked staff, etc. These may be causes, but they do not represent the corrective actions. Research in the experiment stations will continue to be done by the researcher directing four or five projects. Graduate students and their theses will continue to be the major vehicle for getting work done. Staff will continue to come and go.

The real solution to "timely research" depends upon an improvement in the selection of research problems and our methods of attacking them. As mentioned earlier, there is a tendency for each problem to be treated as if it were completely new and unrelated to other work. Start from scratch and run out and do a field survey is often the first reaction. Two points seem clear. If the problem is one that requires original field work and the answer is needed in two or six months—or even a year, this

research had best be done outside of the academic setting. Our public relations would improve if we were more honest with ourselves and our clients in this respect.

The other point, however, is quite different. Many problems deal with the impact of a new development or the questions of future developments. No field surveys are going to answer these as our laboratory of people and their actions is not available. Here we need use our training as economists and from the synthesis of already available research results attempt our evaluations. Success in having timely results here requires of course, that our research projects furnish us with a continuing supply of building-block data and relationships that we can use in our work.

I cannot leave this area without a mention of the role of descriptive research. I am not sure just exactly what descriptive research is. But we have taken critical aim at it ever since I have entered the profession. If descriptive research means the assembly of facts, bench-mark data and building block material, then I emphatically do not agree with its widespread criticism. I can agree with Southworth when he said, "I am increasingly impressed with how much there is to know about marketing and how little we actually know in the way of concrete factual data."<sup>1</sup> Perhaps the criticism of descriptive research is really a criticism of poor unorganized, unmeaningful description which cannot be used in any further work. This may be true—but this is a criticism of method and quality, not of subject matter and purpose. If we acknowledge that the answer to many problems is one of synthesizing alternatives, then facts we must have.

#### *Concerning research problems and progress*

*Very little progress has been made in the development of useful generalizations and theoretical concepts.* O. V. Wells, speaking about contemporary agricultural economics in 1953 said "No satisfactory book dealing with advanced theory in marketing has appeared. In fact, . . . this is still the field in which agricultural economists are the least sure, the field where they are most inclined to get lost in an ever-growing mass of detail."<sup>2</sup> In my opinion, he may justifiably make the same statement today. The only real change is that the "ever-growing mass of detail" has continued to get still more confusing. Others in our ranks have pleaded the need for theory development in specific areas. Southworth, for example, in 1954 made a special plea for the development of some principles of

<sup>1</sup> H. M. Southworth, "Principles in the Area of Consumer Behavior," *Journal of Farm Economics*, Proceedings, December 1954, p. 1071.

<sup>2</sup> O. V. Wells, "A Survey of Contemporary Agricultural Economics," *Journal of Farm Economics*, Proceedings, December 1953, p. 664.

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consumer behavior.<sup>3</sup> It still remains unanswered. Others have chided us that we do not use economic theory enough. I am not sure whether this is the case or whether we have found the available theory not helpful. In either case, the flowing stream of empiric data is certainly a logical source of power for the development of helpful generalizations. Awaiting on the lightening of specialized theoreticians to strike us in needed places is likely to be a long wait. If we want such service, we shall have to supply it ourselves.

*In many instances, the marketing researcher has abdicated the position where his training gives him the best opportunity for fruitful existence—that of an economist and social scientist.* Part of this has been done under pressure from those who have been guiding our work. In each of the national marketing workshops, the same theme was hammered upon: Get into the harness with the engineer, the agronomist, the chemist, the production science specialist. The problems to be solved were ones of man and machines, man and process, and methods and man and products. This wedding has occurred. Though in many instances it was not the result of a team, but of economist turning engineer or agronomist or of an engineer turning economist. I, for one, believe that these efforts have resulted in some excellent research.

However, such emphasis neglected a very important point. Many of the problems of marketing are those of man with man, with man's operating institutions and their relationship to each other with his overall institutional creation called government. In attacking these problems, the economists ally is not the engineer or physical scientist, but rather the other social scientists—sociologists, psychologists, anthropologists, historians, and political scientists. At no point is the difference between us in agricultural marketing and our colleagues in nonagricultural marketing so clearcut. While we were calling for increased recognition of the physical scientists the nonagricultural marketing people were calling for the integration of psychology, sociology and anthropology. While we have been struggling with time and motion techniques, linear programming, budgeting, etc., they have been struggling with human behavior motivation, personnel relations, etc. In my opinion, our professional group in general is farther advanced in such areas as cost analysis, work methods, etc. On the other hand, nonagricultural marketing people have out-distanced us in such areas as managerial economics, human behavior, survey techniques and questionnaire design. Both groups can learn from each other. Certainly we cannot continue to ignore their literature in many areas of importance to our endeavors.

Our problem is now one of maintaining a balance. We do not want to

<sup>3</sup> Southworth, *op. cit.*

give up our benefits from our increased liaison with physical scientists and production area specialists. But on the other hand, we are basically social scientists and must establish fruitful relationships with the other specialists in human behavior. The establishment of this latter "team" will present even greater difficulties than those faced in obtaining our production area contacts. At least up to now most of our contacts have had common bond of being in the schools of agriculture. The new liaisons require reaching across school boundaries for with the exception of agricultural economics and rural sociology these fields are outside of traditional schools of agriculture.

*Small, specialized problems have been attacked with vigor, but larger, broader problems have received inadequate attention.* How individual firms can improve their activities; how shippers of commodities can cut their costs; how labor can be saved—questions of this micro-nature have received attention and the results have been fruitful. However, such issues as integration, decentralization, the end results of product branding, the measurement of competition—such broad national or industry-wide issues have not received adequate attention. In part, this is a restatement of Professor John D. Black's insistence that we must attack marketing systems as "a whole."<sup>4</sup> A similar issue was apparently in the minds of those speaking at the 1956 Marketing Workshop, for in several instances the necessity of recognizing many problems of agricultural marketing policy was stressed.

Over the years, we have harranged ourselves to choose significant, but specific, problems. We have complained our projects bit off too big a chunk. Here, we had considerable improvement. Our individual studies apparently *are* more limited and the results *are* more directed to a specific problem. However, this very improvement has probably contributed to our short-comings in studying broader issues.

Attack on these broad issues is not a project proposition. Helpful research here must be a synthesis proposition of the findings of many individual specific projects. Currently we are in the position of having an army of workers and harvesters in the vineyards, but an acute shortage of distillers of fine wines. Professor Converse, who many of you will recognize as a leader in nonagricultural marketing, in discussing who were making contributions in the area of broad-problem solving research made the following comment: "Most discouraging is the record of the U.S.D.A. and the state experiment stations. Considering their staffs and expenditures, they have made relatively few basic studies. . . . The U.S.D.A. and the experiment stations make many good studies and issue many reports, but most studies deal with specific problems. They seem to be so busy

<sup>4</sup>J. D. Black, "Line of Advance in Research in Marketing," *Journal of Farm Economics*, Proceedings 1954, p. 1061.

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studying the trees that they do not see the forest."<sup>5</sup> This perhaps is a hazard of those who are public servants. As many of you can testify, it takes a lot of time to handle the "urgent problems" of our farm and business employers. However, the need is present to find some way to protect the time of those who might be able to pull together and distill the meaning of the widely scattered informational bits which come from our projects. For example, the unorganized and fragmentized knowledge of marketing costs and margins and marketing channels is enormous. But the only sources of total and organized information of these facts are the U.S.D.A. commodity publication series of the 1939 data. Though this is a problem, I must admit that I do not see any easy solution in the present land-grant, experiment station operational pattern.

I increasingly believe that Southworth in 1952 hit upon a very significant point.<sup>6</sup> He urged us to recognize that we are not the only problem solvers. In the problems involving firm vs. firm, industry vs. industry, or industry and government, individuals in charge—business managers, trade leaders, politicians—will choose the solution they wish to attempt. In many of these broader issues it is our challenge to evaluate the outcomes of alternative possible solutions. It is a valid goal to discover the best way to load watermelons for shipment or to peel a tomato in a canning factory. Such precision gives great satisfaction to the researcher, but cannot be expected when the broader issues are studied. I would suspect that part of this problem of begging the broader problems is tied to our retreat from being social scientists discussed above. Perhaps another reason for avoiding these problems is that they represent controversial issues. Controversy is at a minimum when we study problems of firm or process efficiency. But when we analyze total systems and industries, controversy over the findings is bound to be sharp. If, however, we recognize that in many areas we are not problem solvers but problem analyzers, we can sail fruitfully in these troubled waters.

#### *Progress in Specific Research Areas*

Departing now from the generalizations of our successes and short comings an evaluation of our research progress and needs in more specific manner is in order. In presenting these, I have chosen to divide the marketing research efforts into three categories: (1) areas of most improvement and greatest success, (2) areas of either modest activity or modest success, and (3) relatively neglected areas needing emphasis.

<sup>5</sup>P. D. Converse, "Who Does Basic Marketing Research?" *Journal of Marketing*, April 1955, p. 354.

<sup>6</sup>H. M. Southworth, "What Has Regional Research Contributed to Marketing," *Journal of Farm Economics*, Proceedings 1952, p. 875. See also J. E. Jeuck, "Marketing Research—Milestone or Millstone," *Journal of Marketing*, April 1953, p. 381 and "A Reply" by Ralph Westfall, *Journal of Marketing*, October 1953, p. 174.

*Areas of most improvement and greatest success*

- 1) Development of new and improved statistical series. Ten years ago this was listed as a critical area. Though economists never admit to enough statistics, we certainly have improved greatly in this area.
- 2) Micro-studies dealing with materials handling, men and machines, work methods, etc., with the usual end-goal of reducing costs. The volume of results here is large and, in the main, has found wide acceptance and use.
- 3) Facility planning work ranging from the large studies of improved terminals to the improved design of locker-plants, elevators, etc.
- 4) Quality maintenance research. This ranges all the way from how to load railroad cars to reduce damage to how to handle produce in the retail store.
- 5) Costs and margin data. The flood of cost and margin work certainly has given us a much improved picture of our marketing machinery. Though one often wonders just exactly what to do with these data, nevertheless we certainly have improved our supply.

*Areas of either modest activity or modest success*

- 1) Consumer preference and behavior research. Much has been done in this area and there is considerable pressure for its expansion. However, to make meaning out of this work is often very frustrating indeed. Our nonagricultural marketing colleagues have dropped much of their efforts in the traditional preference area and have moved into the deep-sea of motivational research. Certainly we need re-value both our procedures and the goals of this research before ploughing the same ground over and over.
- 2) Research on quality standards and standardization. Though individual examples of success show through here and there, much remains to be done.
- 3) Research in market news, information, its use and dissemination. Market structure changes now underway mean that this area will need some re-thinking.
- 4) Research on price determination. Here and there price studies have been done in recent years. However, our outlook and prediction work sadly needs up-dating and re-examination in this postwar period.
- 5) Output and location studies with particular emphasis on the linear programming technique. Since most of this work has currently been in an exploratory manner, it is too early to evaluate its future contributions.
- 6) Bench mark data and description work. As our economy changes such studies will be increasingly needed to aid in obtaining a factual picture of just what is the situation.

*Relatively neglected areas needing emphasis*

- 1) Research into the mechanics of pricing and the nature of competition at all levels of marketing. Too long have we lived in the folk-lore heaven of perfect competition. With the increasing complexities of market organization, we must look at what is occurring in the light of facts rather than assumptions.
- 2) Research that evaluates different market and industry organizations and

systems. A current example of this would be the impact of integrated systems.

- 3) Research into the effects of the various actions of government regulations and industry and trade groups. The role of these larger aggregates in determining marketing practices and policies is becoming increasingly important.
- 4) Research into the field of consumer economics. Understanding here is going to need more than preference and acceptance work if it is to be of future predictive value.
- 5) Research on the farmer as a consumer and the agencies selling to him. We have become so involved with his selling problems that we have largely overlooked the large role which his buying activities play.
- 6) Research efforts to generalize and theorize on all fronts.

The above brief discussion of marketing progress and needs is highly colored by the previously discussed generalizations. It reflects the opinion that future research must wrestle with the problems of larger aggregations than processes and firms. I hope that this can be done without sacrificing our good and continuing progress in the latter area. We will have better trained personnel. If we can overcome our communication and some procedural problems, we should be better able to use our accomplished research as building blocks and stepping stones in solving other problems. Sometimes our role is that of fact-gatherers; sometimes, that of finding the best answer, and still under other circumstances, that of consequence analyzers of alternatives. If we recognize what is desired of our research in different situations, the fact that the issues are controversial will not unduly handicap us.



## A CRITICAL APPRAISAL OF AGRICULTURAL MARKETING EXTENSION EDUCATION

RAYMOND C. SCOTT\*

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**O**LIVER WENDELL HOLMES once said, "It seems at this time we need education in the obvious more than investigation of the obscure." I do not subscribe entirely to this philosophy, but I am sure the results of investigation, research, or classification of knowledge contribute little to economic growth without application. This is the mission of extension marketing work—helping management of individual firms and industry groups make maximum use of pertinent available knowledge in analyzing and solving their problems.

In attempting to appraise the extension marketing program I shall first review the objectives of the work as seen by the representatives of the people who founded and support the cooperative extension service. I shall then view the program objectives as seen by representatives of the federal and state extension services charged with carrying out the intent of the Congress. In an appraisal of programs, recognition should be given to the fact that 51 states and territories operate under different state laws and administrative officials also have to consider the points of view of state legislatures and county and state program advisory committees as well as the intent of Congress and USDA advisory committees in developing programs. Recognition should also be given to the fact that during fiscal year 1958 about 60 percent of funds available to the extension service will come from state or county governments.

### *Legislative Background*

Most of the extension marketing work in the United States is conducted under cooperative agreements or projects between state and federal extension services. Work under these cooperative agreements or projects is generally financed in part with Smith-Lever or Agricultural Marketing Act funds.<sup>1</sup> The objective of the Smith-Lever Act is quite broad, while that of the Agricultural Marketing Act deals specifically with marketing work as implied.

#### *Smith-Lever Act*

The cooperative extension service was established with the passage of the Smith-Lever Act of 1914 and amended by PL 83, 83rd Congress. This

\* Director, Division of Agricultural Economics Programs, Federal Extension Service.

<sup>1</sup> Of the total of state marketing budgets, about three-fourths is financed with AMA project funds.

act gave the extension service responsibility to "aid in diffusion among the people of the United States useful and practical information on subjects related to agriculture and home economics and to encourage the application of the same."

The founding fathers of the extension service envisioned much more attention to marketing and economics generally than has been fully realized in many states even today. In a report by the committee which considered and recommended the Smith-Lever legislation to the Congress, the following statement was made: "The itinerant teacher or demonstrator"—referring to the county agent—"will be expected to give as much thought to the economic side of agriculture—the marketing, standardizing, the grading of farm products—as he gives to the matter of larger acreage yields. He is to assume leadership in every movement whatever it may be, the aim of which is better farming, better living, more happiness, more education, and better citizenship."

The responsibility given the extension service with the passage of the Smith-Lever Act was very broad, and it is apparent that the intention was to give considerable attention to economic aspects of agriculture, both production and marketing. The need for marketing work has been prominent among the items included in the justification for increased funds in recent years.

#### *Agricultural Marketing Act of 1946*

The objectives of the act, as viewed by the Congress, are as follows:

"The Congress hereby declares that a sound, efficient, and privately operated system for distributing and marketing agricultural products is essential to a prosperous agriculture and is indispensable to the maintenance of full employment and to the welfare, prosperity, and health of the nation. It is further declared to be the policy of Congress to promote through research, study, experimentation, and through cooperation among the Federal and State agencies, farm organizations, and private industry, a scientific approach to the problems of marketing, transportation, and distribution of agricultural products similar to the scientific methods which have been utilized so successfully during the past 84 years in connection with the production of agricultural products so that such products capable of being produced in abundance may be marketed in an orderly manner and efficiently distributed."<sup>2</sup>

The intent of Congress in passing this legislation was to provide for considerable emphasis on marketing work with all segments of the industry and consumers.

#### *Objectives of Extension Marketing Work*

The objectives of extension marketing work are difficult to classify because of the nature of the organization, there being 52 separate operating

<sup>2</sup> The Agricultural Marketing Act, 79th Congress.

units, and diverse problems in various parts of the country. Among state administrators the interpretation of marketing responsibility varies greatly, particularly under the Smith-Lever legislation. An effort has been made to clarify extension marketing objectives as follows:<sup>3</sup>

"1. *To expand the market for farm products.* This may be done by helping farmers and marketing firms produce new products and enlarge markets for existing ones through consumer information programs, changing the marketing organization, or effecting a more favorable price by creating greater efficiency.

"2. *To reduce the cost of marketing farm products.* This means development of the best possible marketing system with efficiency through each step, and better communications among all segments of the marketing process.

"3. *To provide a better understanding of all phases of marketing* and to get rapid adjustment by farmers, consumers, and marketing firms to changes in technology, supply and demand."

The subcommittee also concluded that the specific objective of educational work with marketing firms is "to increase the technical and economic efficiency of firms, maintain and improve product quality and expand the total market."<sup>4</sup>

In line with the intent of Congress to devote most of the resources appropriated under the Agricultural Marketing Act to improve the distribution of agricultural commodities, a policy statement was issued to implement the declared policy of Congress. This policy statement<sup>5</sup> indicates the scope of work that may be financed with AMA funds:

"1. Assisting marketing agencies and individuals (including producers who perform some or all of these functions) through providing information and helping them interpret and apply results of research and other marketing information, with respect to assembling, grading, packing, processing, storing, warehousing, transporting, wholesaling, retailing, buying, selling, and financing the ownership of agricultural products and processed forms during marketing of these products, including farm crops, livestock, dairy products, poultry, forest products, fish and horticultural specialties.

"2. Assisting marketing agencies, individuals and groups in making decisions with respect to the development of efficient marketing systems that (a) will provide effective and accurate communication of supply and demand information between consumers and producers of agricultural products and appropriate reactions; and (b) will effectively and efficiently perform the services listed in paragraph 1, or other marketing services demanded by consumers and (c) will expand the market.

"3. Providing consumers with timely and objective marketing information on: (a) present, prospective and relative market supplies, prices, qualities; (b) demand, selection, new products, home storage, labor and other resource ex-

<sup>3</sup> Minutes of the Extension Committee on Organization and Policy meeting, June 1957.

<sup>4</sup> "Objectives and Considerations in Developing an Extension Educational Program with Marketing Firms," FES-USDA, April 5, 1956.

<sup>5</sup> "Scope of Work That May be Conducted with Agricultural Marketing Act Funds," FES-USDA, May 1957 (Mimeograph number AEP-90).

penditures considered in use of the product; and (c) services performed in paragraph 1 that affect their decisions."

It would seem from the above that the leadership in the extension service has accepted the responsibility for developing a broad marketing educational program. Program planning and advisory committees, including the USDA's RMA advisory committees, have strongly supported and are urging that greater emphasis be given to extension work in marketing.

### *Appraisal of Programs*

Several approaches might be followed in making a formal appraisal of extension marketing programs. In the appraisal, questions should be raised and answered which indicate areas of emphasis, direction of the work, and responsiveness of the program to the needs of the people as reflected in expressions of intent by appropriating bodies and program emphasis as expressed by program planning and advisory committees. Consideration should also be given to how well we are generally measuring up to the goals or objectives that have been established for the organization, and what are some of the impediments to more effectively attaining these goals. The following are illustrative of the type of questions that might be raised:

1. Are we directing our programs in line with the intent of appropriating bodies? In case of conflict among various appropriating bodies can programs be built to satisfy all concerned?

2. Are we accomplishing our objectives?

3. Are we responding to the needs of our constituents as reflected through recommendations of advisory committees and other means?

4. Does our organization facilitate or impede work on problems common to several counties or regional in scope? Does it aid the distribution system when production is in a different county or state from the distribution and consumption? Does it provide assistance to those specialized marketing firms that are few in any one county or state, possibly handling a large volume of business, and very important in the economy as a whole? Does it provide service to the specialized technological and economic needs of individual firms, frequently large in scale and well integrated and, at the same time, service to their broader problems in management? Does it encourage effective macroeconomic analysis and education dealing with macroeconomic effects and impacts of changing technology and economic conditions?

5. What changes are needed in extension's organization to simultaneously better facilitate work with marketing firms while continuing to serve the traditional needs?

6. Are we concerning ourselves with "putting out fires" rather than

devoting our attention to basic problems that will lead to long-run gains?

7. Are we keeping pace with research in shifting program emphasis?

8. Do we function merely as "peddlers" of specific research information or are we concerned with teaching the application of research findings and principles to our constituents? Are we evaluating the conditions under which research findings apply?

9. Do we have a sufficient understanding of research methods to adequately appraise the limitations of findings for general application from specific studies?

10. Have we seriously studied the place of specialists in relation to the marketing and other agents in our present and future programs?

11. Have we adequately appraised the opportunities and limitations of conducting marketing work with marketing agents or other agents?

12. Can existing or proposed marketing agents function more effectively on a market-area basis or in political subdivisions?

13. In light of the opportunities available to them, what contributions are being made to the marketing educational program by the regular county staff? Have we provided adequate inservice training opportunities for them?

14. What specializations (commodity and functional) are needed in specialist staffs and how can these be most effectively organized to serve and handle needs of firms and individuals performing marketing functions in their needs for specific expert technological and economic assistance, broad management assistance, and macroeconomic analysis.

15. Is the provision for expanded staffs of highly trained specialists working directly with marketing firms a partial answer to meeting the needs of specific industries?

16. Can specialists better serve marketing firms if they are joint research-extension employees?

17. Are we making maximum use of marketing research conducted by other colleges and the USDA in our program?

### *Appraisal*

Neither time nor information available makes it possible to make a complete appraisal of the extension marketing program or to answer all the aforementioned questions. An effort will be made, however, to appraise the program from the standpoint of the objectives, organization, clientele and subject matter or substance of the program.

### *Objectives*

It would appear that legislators, farm people, and others with whom extension works, are of the opinion that extension should devote considerable resources to increasing efficiency of performing marketing and

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processing functions, expanding markets, and promoting a better understanding about the marketing system for agricultural products.

Some progress has been made. About one-third of the specialists added during fiscal years 1955 and 1956 were assigned to marketing. There has been a marked difference among states, with some developing comprehensive programs in recent years and others giving little or no attention to work beyond the farm fence.<sup>6</sup> A large part of the additional extension marketing funds in recent years has gone into increased work with consumers and farmers and a very limited amount of work with processors and distributors. Much effort must be placed here in the coming years if we expect to make any significant contribution to increasing the efficiency of processing and distributing farm products.

More widespread acceptance of the objectives established by the marketing subcommittee of ECOP would represent a marked step forward.

### *Organization*

Few, if any, administrators would admit that we have arrived at the most satisfactory organization for conducting extension marketing work.

One of the impediments in the further development of extension marketing work in many states has been the failure to assign responsibility for leadership of the program to one individual. A subcommittee of the extension directors discussed this at a meeting in Chicago in 1954 and concluded that some individual, responsible to the director, should be assigned leadership in the development of the marketing program.<sup>7</sup> Since that time, individuals have been assigned the responsibility for the total extension marketing program in several states. Most of these individuals have been located in one department, usually agricultural economics. While great strides have been made where this arrangement exists, one of the problems has been that of coordinating specialists in other departments who have a contribution to make in marketing. The organization should be such as to make maximum use of personnel in various areas of work who can contribute to the program.

Further questions concerning organization involve the relationship between organizational lines for traditional work in the counties and organizational lines for marketing. While much of the traditional extension work has been conducted through county extension agents, more and more of the work with marketing firms, particularly the larger ones, is

<sup>6</sup> During fiscal year 1958 the 15 states having the largest extension agricultural marketing act budgets are using 57 percent of the total extension AMA budget while the 15 states spending the least are using only 8 percent of the total.

<sup>7</sup> Report of Extension Administrative Conference on Expanding Marketing Educational Programs, Chicago, Illinois, May 21-27, 1954, FES-USDA, Washington 25, D.C.

being conducted directly by specialists or specialized marketing agents. Marketing agents tend to specialize in limited areas and are usually in a better position than are regular county staffs to analyze problems of marketing firms and point to alternative solutions.

The place of marketing agents in the state extension organization is also of concern in many states. As agents are employed to operate on a market-area basis they do not fit into the traditional pattern of assistant county agents. In some states, they are employed as agents at large, responsible to a district supervisor; in others they are responsible directly to the state marketing program leader; while in others they are responsible to a local county agent. Some local organizational relationship seems important, particularly if the marketing agent has responsibility for any marketing work with farmers. A close relationship must also exist with specialists, particularly since marketing specialists frequently do considerable direct educational work with marketing firms.

Very few states have assigned marketing agents to work on a county basis. Where this has been done and the agent tends to specialize in his work, often insufficient marketing work has been available to provide full-time, year-round employment and there is a tendency for him to assume some production responsibilities. Where marketing agents attempt to operate as generalists, it is difficult for them to acquire sufficient knowledge about marketing operations of several industries to adequately serve them.

Strong administrative support, as well as effective organization, is important to obtain adequate funds, achieve coordination of specialists or subject-matter departments, and create a favorable climate for development of the work. Much progress has been realized during the past decade. Most directors of extension appointed in recent years have had an increased appreciation for extension marketing work and have supported it; many others have seen real opportunities for service in this area.

The type of organization to most efficiently work on regional problems has been of concern to extension for some time. Experimental work with regional specialists has not been a satisfactory solution. The use of regional committees to obtain concerted effort by state personnel on problems common to two or more states seems to offer promise.

### *Clientele*

In recent years extension administrators have developed a great deal of interest in serving certain segments of our agricultural marketing sector of the economy. This represents a marked step forward since little extension marketing work was done beyond the farm prior to World War II, except, for example, with cooperatives and dairy plants.

With the passage of the Agricultural Marketing Act of 1946, and the availability of additional funds for marketing work, considerable interest was developed in work beyond the farm. The Federal Extension Service entered into contracts to demonstrate the opportunities in supplying marketing information to consumers and to increase the efficiency of retailing. Much interest developed in these areas, particularly with consumers. This program has expanded rapidly in recent years and now budgets for the work make up nearly thirty percent of the total financed with AMA funds. Programs have been established in metropolitan areas comprising more than half the people of the United States.

Considerable interest was developed in conducting educational programs with retailers in the late 1940's and early 50's. Specialists were employed by several states, but work in this area has not experienced marked expansion as has work with consumers. Projects employing from one to five specialists per state are in operation in only 11 states, while more limited work is being carried on by commodity specialists in about one-half the states. This area offers great opportunity, but extension has moved rather slowly in spite of urgent requests by industry advisory committees for several years.

Commodity marketing specialists have worked with shippers, wholesalers and other firms between the producer and the consumer to some extent for a number of years. Much of this work has been carried on to promote an exchange of points of view and develop understanding between the farmer and operators of marketing firms rather than increased efficiency of marketing firms and the over-all market organization and structure. Exceptions exist, of course, such as programs with operators of dairy plants dealing with technology and programs with retailers aimed at improved merchandising of specific commodities. Limited work has been conducted in the past two years by the federal and state extension services aimed at increasing the efficiency of fruit and vegetable processing plants and cotton textile mills. Work in these areas has been concerned primarily with the adoption of specific technological developments with limited appraisal of their impact on the business by economists or others. With the great amount of interest in utilization or processing research at the present time, and the strong possibility of a marked expansion in the research program in this area during the coming years, a great challenge exists for extension, both for economists and technologists.

Considerable marketing educational work has been carried on with farmers, starting in the 1920's and expanding rapidly in the 1930's in many states. While most of the work with marketing firms and consumers have been carried on by specialists, or specialized agents, farmers

have been assisted by county agents on many decisions such as what, when, where, and how to sell. Agents have been instrumental in helping farmers develop cooperatives to market their commodities in many areas.

There is need for a more realistic appraisal in many states of the needs and opportunities for educational work in marketing. Such an appraisal would, in all probability, lead to much more emphasis on work with operators of marketing and processing firms.

### *Substance or subject matter*

Much of the extension marketing work has been carried on in the area of agricultural economics. An exception exists to some extent in the marketing information program for consumers, which has received limited attention from economists in some states. While there is great need for further expansion in marketing economics, consideration should also be given to bringing the know-how of engineers, chemists, bacteriologists and the like to bear on marketing problems. The extent to which this is done depends upon the type of organization established to conduct marketing educational work as well as the clientele to be served.

In extension marketing work with firms, (other than farms) more attention should be given to the *team approach* involving agricultural economists, technologists, business management specialists and the like. Much of the work to date has dealt with particular practices. The problems of marketing firms are such as to require much specialized assistance, perhaps as broad as that provided farmers by extension.

An area of work with marketing firms which has received little attention by extension but offers great opportunities is materials handling and work methods. In a few cases engineers and economists have worked as a team in this area. Cornell University is conducting a study to develop and test methods for doing educational work in this field. It is important to recognize at this point, however, that the extension service has made some important and lasting contributions in helping farmers and entrepreneurs of rural marketing firms analyze their needs for market organizations and facilities and in work on marketing practices such as merchandising, grading, packing, and so forth.

Another subject matter area deserving much consideration is that of utilization. Utilization deals with the development of new products and new and improved processing methods for agricultural products. A presidential commission recently reported on the needs and opportunities in this area and suggested the research budget of 16 million dollars be tripled.<sup>8</sup>

<sup>8</sup> Interim Report to the Congress from the Commission on Increased Industrial Use of Agricultural Products, April 19, 1957.

Limited extension work is being conducted in this area at the present time. The Federal Extension Service has four employees working with the regional USDA laboratories and the state extension services. A survey conducted early this year indicated that in the state extension services 109 man-years of extension specialists' time was being devoted to utilization or processing. Experiment stations were spending slightly more time conducting extension-type work in this area. Much of the effort in this area has dealt with the technology of a new or improved process or operation, and limited attention has been given to an economic appraisal of the impact of developments on farmers, individual firms and industries. As the research program in this area unfolds, extension economists will have an important responsibility, and indeed an opportunity, to make some important contributions in this area of marketing and processing firms.

Although much of our work with farmers has involved practices such as grading, merchandising, packaging, and the like, we need to recognize that in many states important contributions have been made in market organization and structure. For example, significant contributions have been made in assisting industries in the development of facilities for storing grain and for marketing livestock and fruits and vegetables during the past few years. We do need to give more attention to such problems as the impact of integration on various industries and its impact on the different segments of each industry.

In no area has extension had greater difficulty in determining the type of subject matter needed to most effectively accomplish our objectives than in the marketing information program for consumers. This program has been carried out through mass media and it has been difficult to test its effectiveness. Very limited research has been conducted to provide a guide. All too frequently the main source of information has been local firms. In these programs there is insufficient use of objective data and analysis, such as we provide farmers through our outlook program. This program could be strengthened materially by greater participation on the part of economists engaged in outlook and commodity marketing programs. The current shift to the employment of economists on this program in state extension services is aiding materially in strengthening subject matter presented.

Problems and opportunities in marketing undoubtedly are just as great as those with farmers. If the know-how of the various specialized groups employed by extension can be brought to bear on these problems, we should be able to make as great a contribution beyond the farm in the future as we have on the farm in the past.



*The future*

With the expanding body of research findings becoming available, and the growing awareness of the needs and opportunities for extension marketing work on the part of the people as expressed by extension program planning and advisory committees to the colleges and to the USDA, I view the future of extension marketing work with considerable optimism. Our success will depend on our ability to analyze marketing problems and to view opportunities realistically. This can be accomplished by development of a staff with training and experience comparable with our research counterparts, and with the type of organization that promotes teamwork among the various disciplines and encourages professional growth of the individual.

### DISCUSSION: A CRITICAL APPRAISAL OF AGRICULTURAL MARKETING EXTENSION EDUCATION

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*Kansas State College*

This discussion of marketing does not involve quantitative measures of success or failure. Such measures are impossible without well-defined goals, the achievement of which can be measured. However, even though such measures are lacking, expressions of opinion are justified because there is in being an active extension program in marketing.

Dr. Scott has presented a straight-forward discussion of objectives of marketing extension education together with his opinion of how these objectives are being achieved. There is little *in* his paper with which to quarrel. But there is some territory left *out* of his paper that I feel should be discussed.

Farmer purchases of factors of production generally are ignored in current discussions of the field of marketing—by both extension or research. Why is this so?

A tentative draft of a policy statement from the Extension Committee on Organization and Policy outlining responsibility for marketing extension education recognized that "Businessmen supplied 16 billion dollars worth of supplies for farms." But after recognizing 16 billion dollars worth of farm market, no provision was made for educational work in this field. This situation should not be permitted to stand unchallenged.

This area also is not specifically recognized in the policy statement entitled, "Scope of work that may be conducted with agricultural marketing act funds."<sup>1</sup> By stretching some of the permissive language, some

<sup>1</sup> Scope of Work That May Be Conducted with Agricultural Marketing Act Funds," FES-USDA, May, 1957 (Mimeographed Number AEP-90).

work could be done. But why not recognize it outright? Some may argue that "the law or administrative rulings doesn't authorize this kind of work." If this is the case, then the law or the administrative rulings ought to be changed.

When a farmer sells corn to a neighbor the presently visualized program would presume a place for extension. But when the neighbor buys corn from the farmer we find no place for extension marketing educational program. In other words, we can educate the farmer who is selling, but not the farmer who is buying. When ten farmers each sell a different product to a feed manufacturer, we have a place for extension. When the feed manufacturer blends these ten ingredients into one commercial feed to be sold to farmers, we have a place for an extension program. But when farmers buy that feed, we have no extension program. Programs with feed dealers are permitted because extension is working with middlemen who are handling a farm product.

In the feed case, there are two places to apply a marketing educational program; with the feed manufacturer and with the farmer who buys the feed. As I read the policy statements it is permissible to educate the feed manufacturer but not the farmer who buys his product.

I will grant my examples have been of farm-produced goods. Would not the same reasoning apply to industrial goods bought by farmers? Surely it is a marketing extension problem to supply information resulting in farmers being better informed regarding products supplied by businessmen.

It is important that farmers be informed as to the market situation for fertilizer, manufactured feeds, petroleum products, and other supplies along with a comparison of the job they will do for the farmer. We constantly plead with farmers to adjust their operations to market conditions. For example, feeding rates of protein and grain should be adjusted to their relative values in the market as compared with the job each will do in the feedlot. In other words, market information should be provided as a basis for farmers to adjust their farming practices. A device has been developed which will aid in using the results of experimental research even though changes in market relationships have taken place. It needs only to be taught to farmers.

We could, I suppose, label this type of information "management" but if so the label would be a general term inclusive of marketing and not a separate term specifically applying to the organization and operation of a given farm.

There likely would be strong resistance to an educational program along the lines indicated and perhaps this is why very little is being done. But already we have laws in forty-seven states requiring labels on such

things as feed, seed and fertilizer. Perhaps an extension program of the kind I have in mind could be built around these services.

One important point, often an obstacle to be overcome, is the basic difference between marketing education and the traditional extension program. For example, when we teach a farmer how to use lime we do not directly reduce the income of his neighbor. But when we teach one marketing firm how to be more efficient, the income of his competitor likely will be affected.

Although this problem is well known, it is mentioned here because as yet no general educational practice has been developed to deal with it. I suppose our marketing extension education programs have been limited by the traditional. As Scott points out, we must find ways to handle these kinds of situations within the extension framework.

Scott opened the subject of organization by asserting "One of the impediments in the further development and expansion of extension marketing work in many states has been the failure to assign leadership for the development of the program to one individual." I suspect the reverse may be of equal accuracy; i.e., failure to develop a program by marketing personnel has resulted in not assigning leadership to one individual. My only point in bringing this question in for consideration is that organization doesn't always solve the kind of problems we are here dealing with. There probably isn't any "one" answer to this question.

In conclusion, I would like to suggest the marketing subcommittee of the Extension Committee on Organization and Policy answer each of Scott's 16 questions. These questions must be answered. These problem areas are being solved in practice and perhaps without very much thought as to their implication.

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## AGRICULTURE AT THE CROSSROADS

Chairman: Mervin G. Smith, Ohio State University

### THE STATUS OF FARM PEOPLE IN THE UNITED STATES\*

RAYMOND J. PENN

*University of Wisconsin*

THE FIRST thing I want to do is take exception to the title of this section, "Agriculture at the Crossroads." To me it suggests that the horse and buggy we are driving is stopped at a signpost where a couple of roads intersect, and we are sitting here deciding which road to take. A more appropriate metaphor might be "Agriculture in Heavy Traffic." Agriculture is not standing still; it is changing continuously and at a very rapid rate, and so are the various economic conditions that affect it. Agriculture does not face—if it ever did—a simple choice of one road or another. It does not face, as we sometimes imply, a single irrevocable decision by which we accept one road and leave the other forever behind. It faces, and will continue to face, a bewildering series of choices and alternatives and decisions, each one representing our effort to improve on what we have at the time and to take advantage of the new opportunities before us. This condition of continuous decision making is not an accident of this particular point in history. It is an unalterable fact of life about a world of rapid technological change.

This rapid rate of change is, I believe, the most significant factor affecting our economy. This change has made possible an increase in our standard of living even at a time when we have been diverting billions of dollars worth of goods and services to military operations and to support for U. S. world leadership in foreign aid and technical assistance.

The rate of change in the economy is almost revolutionary. There were idealists a few years ago who dreamed of an economy that would support 60 million jobs, of an average family income of \$2,400 a year, and of a gross national production of \$500 billion a year by 1975. Now, ahead of schedule, most of their predictions are accomplished fact.

Comparable changes, of course, have taken place in agriculture. It is hard to realize that we are raising a generation of farm children who will never see a team of horses pulling a binder in the field and who will never milk a cow by hand or clean a kerosene lantern.

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\* Paper prepared for and read at the American Farm Economic Association meetings, Lake Junaluska, North Carolina, August 28-31, 1957. The numbers used in this manuscript are those available to all agricultural economists and come mostly from publications by the U. S. Department of Agriculture, Bureau of the Census, The President's Council of Economic Advisers, Experiment Stations, etc. We are indeed fortunate in the U. S. to have so much information about the general condition of our society and specifically about agriculture.

There is the story of the man in the U. S. Patent Office about a century ago who recommended abolishing the office because everything that could be invented had been patented. Few people today would say we have reached the limit of ingenuity or inventiveness, in agriculture or in other fields. Even Secretary Benson has in the last six months turned major attention to the force of technological change.

In one way or another technological change has been basic to most of the good things that have happened to us. It seems clear, however, that the way individuals and society make adjustments to change is a primary factor in determining the status of farm people. I believe that what farm people *think about* the decisions required by our fast changing economy, and how they go about *making* decisions that reflect their wishes, are the most important things we can discuss under the heading "The Status of Farm People."

### *The Farm Price and Income Problem*

Is there a farm price and income problem? Congress evidently thinks so. It appropriated \$1.2 billion for the soil bank last year, and members of Congress are usually rather responsive to the wishes of their constituents. In 1957 Congress appropriated \$500 million for the acreage reserve even while declaring that it was not satisfied with the program and did not expect it to work satisfactorily in the future. This must have represented a feeling that there is a farm income problem so serious that even an unsatisfactory income support plan is better than none. Those public agencies with which the farmer deals, and especially the land grant colleges and the extension services, also report continued insistence from rural people to devote more attention to farm income and price problems.

Many people, however, feel like the man from whom I buy my gasoline. He looks at his home farm today and sees it as a very profitable operation, at least compared with what it was when he was a boy. He doesn't see why the government or anyone else should be concerned about the income earning opportunities of this farm.

A closer look at the nature of the farm income problem is in order, both to understand the basis for such diverse opinions and to appraise the reaction of farm people and others to new types of programs.

In absolute terms farm people have made a lot of progress, particularly since 1940. Adjusted to 1945 dollars, average net income per farm in the United States increased from \$1,035 to \$1,609 between 1940 and 1956. Average income per farm worker when adjusted by the consumer price index increased from \$621 to \$1,233 in the same period. And the average hours each farm person works per day has been decreasing.

Farm people who have owned their land over a period of years have increased their equities. Farm real estate assets in excess of real estate debt have increased from \$27 billion in 1940 to \$94 billion in 1956. And



land values are continuing to increase. The average U. S. farm operator's net income per farm totaled \$25,776 in the ten-year period, 1947 to 1956. The average value of land and buildings per farm in the same period increased by \$9,718, or 38 percent as much as the total net income. It seems likely that for many farms in the next few years the most important single source of potential income will be the steady rise in the value of land and buildings. No wonder farm people aspire to farm ownership! There is some basis in fact for the comment that farming is a business in which you can lose money every year and yet accumulate enough assets in a lifetime to retire comfortably.

By almost any measure the standard of living has increased on the average American farm since 1940. The index of farm family living in the U. S. with 1945 as a base was 79 in 1940 and 134 in 1954.

Yet farm people have a real concern about the price and income situation, if only a relative one. This concern has substantially increased since 1954. Between late 1948 and mid-1950 and between 1951 and 1954 there was a substantial drop in farm income. But even if farm income had leveled off at the 1948 level and held that position up to now, agriculture would still have lost ground relative to other segments of the economy. One aspect of the farm income problem too often overlooked is that you can't stand still in an economy like ours without actually falling behind. Since 1954 nearly every segment of our economy except agriculture and home building has been expanding and improving its position. Total net farm income in the United States has declined from \$16 billion in 1951 to a little less than \$12 billion in 1956, a drop of 27 percent. (1951 was, course, a year of high farm incomes and there were fewer farmers in 1956.) Total national incomes in the same period increased from \$277 billion to \$343 billion, an increase of 23 percent. (Total population had increased by 1956.) Wisconsin farmers often figure the cost of things in pounds of milk. When they do, they find that a tractor with 20 to 29 horsepower on the drawbar cost 37,000 pounds of milk in 1946 and 66,000 pounds of milk in 1957.

The outlook seems to be that the relative position of the farmer will not improve. Expected increases in production will continue to put downward pressure on prices for most all farm products. This is the case even though the demand for farm products, supported by increases in personal incomes, is expected to be as large or larger than at any time in the past and to continue to increase. The automobile industry, geared to produce 6.5 million cars, meets this kind of situation by producing only 5.5 million and raising the price on each car. Medical associations can raise the doctor's fees, and a labor union can bargain for higher wages. Agriculture has no such control over output and no such bargaining power over price.

Whether or not I have correctly illustrated the reasons, Wisconsin farm

people have very sharply increased their concern about the farm price and income situation since 1954. I suspect this is true in other states, particularly in the Midwest. Farm prices and incomes are real problems that need attention. And the primary reason for the problem is the inability of farm people to participate in the increase in U. S. prosperity.

Balancing production with demand by increasing demand is obviously the most popular alternative with farm people, since this approach would minimize the pressure for production adjustments on individual farms. We have seen rather general support for efforts in this direction: the American Dairy Association, whose objective is to sell more dairy products by "advertising, merchandising, and research"; the school lunch program, particularly the efforts to use milk; research on developing new uses for farm products; programs to sell surplus farm products in foreign markets; etc. There is no question but that efforts in this direction will and probably should continue at an even faster pace. However, economists are well aware that expanding demand for farm products has some limits. The needs and wants of the consumers necessarily set the pattern for such efforts. Consumers with high incomes, as is the case now in the U. S., want more of their food from livestock products. To the extent a shift in this direction can be made, the demand for farm products will be increased since it takes more agricultural resources to produce food in the form of livestock products. On the other hand, much of the effort to increase the demand for agricultural products will have the effect of replacing one agricultural product with another. The demand for total farm products is inelastic with respect to price. Hence, price decreases may increase quantity sold some but will reduce farm income. The future increase in domestic demand for agricultural products will not be much more than the increase in population—certainly not enough to offer early relief from the problem of surpluses.

The other side of the issue, adjusting production to demand, is even more difficult and has not been faced, except with some obsolete tools forged in the late 1920's and 1930's. The five million farm firms make their production plans independently of each other. They cannot take account of the aggregate effect of their production on total farm income. As a result, price, at least in the short run, does not adequately guide production to demand. Considerable research is currently underway or contemplated on the factors affecting supply response. Preliminary results of some of this research at Wisconsin indicate that, in the dairy area, and within the experienced price fluctuations, technology far overshadows price as a factor affecting production.

The issue in the farm price and income situation is how to balance agricultural production with demand at prices that will give agriculture an equitable share of our increasing national income and prosperity.

Efforts to resolve this issue I believe should be guided by what farm

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people want to do. So on this problem I am taking the liberty to set down a few observations based largely on my contacts with the farm people of Wisconsin in our agricultural policy extension program.

Farm people do *not* feel that present government programs are making progress on resolving the basic price and income issues. (The school lunch program and the program to dispose surpluses overseas are exceptions.) I think it is a serious mistake, however, to go from this, as many are doing today, to the conclusion that farm people want to substitute for governmental action the automatic play of the competitive market to set prices, distribute income and direct production and consumption. Farm people generally do not accept the premise that the prices they receive are too high, and there is little farm support for the idea that lower prices can produce adjustments that will give farming an equitable share of the nation's prosperity. Rather, it seems to me, they are thinking there must be a better way of doing the job than the present method. There is a growing feeling that farm people should take the responsibility for the program—financially and otherwise. As evidence one may note the strong support for so-called "self-help" programs. The National Milk Producers Federation has proposed a plan for dairy which would be financed and operated by the dairy industry. In it the price to the farmer would be increased to 90% of parity. The National Grange in cooperation with the National Milk Producers Federation and others early in 1957 presented a dairy plan to be financed and operated by the dairy industry. It contains some features aimed at discouraging production (a variation of the two-price plan). Here again basic dairy prices to the farmer are to be increased. Several commodity groups have formed a rather loose federation (Conference of Commodity Organizations) and have been meeting this year with the primary purpose of preventing the further disintegration of the farm bloc in Congress. But the hope is also expressed that each commodity group will develop a "self-help" program for which all commodity groups can unite in supporting the necessary enabling legislation.

In Wisconsin a new organization of dairy farmers (Dairy Farmers Price Stabilization Association) has sprung up in the last two years. It has, I am told, nearly 12,000 members. This organization contains features that in general conform to the feelings of dairy farmers. (1) It is to be an organization of dairy farmers only—not processors. (2) Its price programs will be financed by dairy farmers and it will have as little government involvement as possible. (3) It will attempt to substantially raise the price of milk—by as much as \$2 to \$3 per hundred pounds. (4) It aims to improve the market power of the dairy farmer through the strength of organization.

The details on how all of this is to be done have not been made at all clear or specific. The organization has tolerated and welcomed discussion of many alternatives, and there has been speculation about such varied

plans as a large national cooperative and a national marketing order for manufactured milk. The organization has also done little to formalize a follow-up program with its members. In spite of these serious shortcomings, the declared objectives of the group are close enough to those of dairy farmers generally that the organization continues to arouse a lot of interest among Wisconsin dairy farmers. In meetings held with county agents in the last two months, at their request, to consider the dairy situation, this organization has invariably been a major topic of discussion. In April 1957 this Wisconsin dairy group combined with some dairy groups from about 25 states to form the National Dairymen's Association.

All this leads me to believe that we are seeing a substantial increase in the desire of farm people to gain monopoly control or market power. Vertical integration as in the poultry industry, may spread to other livestock and commodity groups. We have seen the start in the hog business. A feeder pig cooperative has been organized in Wisconsin. The breeding and many of the management decisions are made by the cooperative so that a uniform, vaccinated, dewormed feeder pig is available at the time the feeder wants one. In another area some of the large retail food outlets are moving to integrate some phases of food processing and production. Elsewhere at this meeting Williard Mueller and Norman Collins are analyzing vertical integration in the fruit and vegetable area. Vertical integration will, I think, be a major development in the near future. The issue will be who controls the key decision-making points in the process. Integration of production, processing and marketing can in many instances reduce costs. The control of the operation can affect distribution of the combined earnings.

Vertical integration is a concept that has captured the popular imagination, with the unfortunate result that many farm people, industry leaders and others feel (or hope) that all by itself it can stabilize and maintain farm prices at "adequate" levels. We have seen just the opposite happen in the broiler industry. Some form of horizontal control or integration is necessary to stabilize prices; and the level at which prices can be stabilized will depend on the extent of horizontal integration at the grower or the processor level. This will require large sized organizations with substantial control over patrons. As a practical matter I believe it will also require governmental action, at least to the extent of legislation to authorize market control and to enforce production and marketing rules.

### *The Agricultural Adjustment Problem*

Closely tied with the whole agricultural price and income problem is the problem of making adjustments on individual farms. As farm tech-

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nology develops, farm operations must be modified to make efficient use of the technique.

Most of the improvements in technology have been such as to place a premium on the larger farm. As a result farm size has been increasing rapidly. Existing farm units place a high value on the strategic additional piece of land, milk cow or piece of machinery that makes the whole unit more efficient. Recent increases in land values reflect in part this situation. It is also reflected in the fact that prices of Wisconsin milk cows have increased at exactly the time that milk prices have been going down.

Emphasis on the increase in size of farm has created problems of acquiring resources adequate for a family farm. In 1940 each person employed in agriculture in the United States used about \$3,500 in all forms of capital—land, livestock, machinery, etc. By 1956 each person used \$15,000 in capital. It is not uncommon for the family dairy farm or Corn Belt farm to require more than \$100,000 in capital. To insure management control of adequate agricultural resources may call for some major modifications in our rules of ownership, tenant contracts, and credit. And it will become increasingly difficult for a single farm firm to equip itself adequately for more than one enterprise. Hence, agricultural economists may have to abandon their long-held faith in diversification and start to encourage specialization.

Another problem of adjustment is that a change in technology often has a different impact on one type of farm than on another. For instance, sprinkler irrigation along with high rates of fertilizer application has made it possible to grow more than 500 bushels of potatoes per acre on sandy land in northern Wisconsin that not many years ago was considered submarginal for any agricultural purpose. To take another example, the small dairy farmer has been put at a disadvantage compared with the larger unit when it comes to the introduction of the bulk-tank cooler or the pipe-line milker.

One result of the increase in farm size and of the differential impact of technology is that more farmers are quitting farming than are beginning. There are fewer farmers in the U.S. and the downward trend in number of farms may be expected to continue. In many rural areas this process has resulted in a small number of young people between 20 and 35 years of age. Whether or not we should call this process a problem, the fact remains it is painful for the farm family to see the son go off to town and the family farm absorbed into that of the new neighbor.

We will undoubtedly see a continued increase in part-time farming. This is one way the farm family which has no possibility of increasing the size of its operation can still increase its income. It is also a common intermediate step for farm families to shift out of agricultural employment by giving the new job a trial without giving up the security of the



farm. In 1956 farm people in the U.S. earned \$6.4 billion in nonfarm income. This is more than half the amount of net income made by farm operators from farming operations (\$11.7 billion).

Agricultural adjustments to new technology are slow in the aggregate and costly and painful to the farm families who must make them. In our "new approaches" to farm problems I hope we consider ways of making it easier for farm people to make these changes and also find ways of speeding them up.

### *The Problem of Integrating the Agricultural and Nonagricultural Community*

Agriculture represents a decreasing proportion of our total population, with the result that nearly all decisions important to agriculture affect nonfarm groups. We may expect nonfarm groups to participate in making these decisions.

To get farmers to agree on a price program is quite a job in itself; but to get such a program through Congress it is also necessary that the program be acceptable to many other groups. Some people have said that the "farm bloc" is disintegrating. I suspect it is just struggling with the idea of developing a complex of programs agreeable both to agriculture and to the rest of the economy. The main reason for mentioning this as a problem, however, is its critical importance to the conservation and development of our land and water resources.

Nonagricultural uses for land and water are increasing rapidly. A million acres of farm land is each year taken up in urban uses. City people move to rural areas, and the rural school system, roads and other services break down under the heavy new load. An industry moves into a rural community and drills a well that dries up 400 farm wells. Laws and procedures are not adequate to cope with problems of this kind.

Areas without substantial urban population still feel urban pressure, for city people want and need more recreation facilities. City people feel rather strongly when they read about the farmer draining a good duck flyway, especially if a story about the cost of price supports is in an adjoining column.

As our economy develops, conflicts in use of land and water are becoming much more severe. The market has not been a satisfactory vehicle to resolve this kind of issue; and we look to tools such as zoning, subdivision control, laws regulating forest crops, sanitary districts or water districts. Farm people and nonfarm people together have to make group decisions about the use of resources, and this is a new experience for both. I am afraid agricultural economists have not in the past made an adequate contribution to resolving such problems involving group action,

particularly those in which farm people are not the only group involved.

The status of farm people in the United States is, I find, a very big subject. I have tried to set down a few statements of fact, some hypotheses, and some observations on the feelings of farm people. These have been loosely grouped into three problem areas. I hope I have at least partially established the need for new approaches to our farm problem. My firm belief is that we are naive if we hope to find a single ideal farm program. Many different types of programs are needed. Nonprice programs will, I believe, become increasingly important.

Finally, I have said nothing about the most important issue of all; and that is how to get along with other countries and accept our responsibilities for world leadership. May I make one concluding observation. Farm women are more deeply concerned on this issue than farm men; but all farm people wonder why it is not possible to use some of our agricultural productive capacity to make friends and to serve humanitarian purposes around the world.

#### DISCUSSION: THE STATUS OF FARM PEOPLE IN THE UNITED STATES

JOE R. MOTHERAL

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Professor Penn has tackled this formidable assignment by selecting three problems which he believes weigh heavily on the minds of American farm people. He has chosen to discuss the problems of farm prices and incomes, of operating adjustments, and of the integration of the farm and nonfarm community. He has consciously avoided analysis of the socio-economic status of farm people as such, although this is suggested by the title. He has elected instead to develop three crucial issues in public policy.

Of these three issues, Penn accords by far the most attention to the relative decline of farm income during the recent years. His position is that an absolute improvement in the income situation of agriculture is not enough, that farm people should have a full share of the bounty of rising national productivity. He suggests that the only practicable way to accomplish this objective is for "farm people to gain monopoly control or power" and adds that it must be a type of "horizontal" control or integration.

This is strong medicine—perhaps too strong for those among us who prefer a pristine approach to the competitive system. Nevertheless, Penn has hauled out into the open the liveliest agricultural problem of the

times. It is one that merits not only the interest but the candor of agricultural economists, most of whom are aware of the problem-solving limitations of model making in an age of price and wage agreements. If farmers could resolve a strike by raising wages somewhat and prices still more, and at the same time reduce their surpluses, the assumption of equality in the marketplace that underlies orthodox economics might be convincing. But so far, only the federal government has had the means of compensating for agriculture's unequal bargaining power.

Now, Penn tells us, government support of agriculture is being lost because of the declining influence of the farm vote and fragmentation of the farm bloc in Congress. He might have added to these the near collapse of farmers' public relations. For example, most consumers have been led to believe that a fall in farm prices means a windfall in the retail market. The facts indicate otherwise. Suppose, for instance, that cotton, wheat, and tobacco farmers received exactly nothing for their crops, an arrangement that should satisfy the most sanguinary retail shopper. Complete elimination of the farmer's share would have such effects as these: A \$4.00 shirt would drop to \$3.68, a 21-cent loaf of bread to 18 cents, and a 30-cent package of cigarettes to 25.4 cents. Not a very heavy offset to agricultural bankruptcy!

All of this, of course, presupposes that marketing margins would not be widened to soak up the savings resulting from paying farmers nothing for their crops, a supposition that is by no means assured. Apparently, this kind of information is not reaching city dwellers, who continue to nourish the belief that they are being taxed double to support farm "subsidies."

What of the thesis that farmers have lost their traditional political strength? The answer appears to be that if it has not already happened, inevitably it will happen. Farm people are becoming hopelessly outnumbered by a city-bred population, whose economic interests frequently are at variance with those of farmers.

In 1920, 28 percent of the babies born in the United States were born to farm parents; by 1955 this percentage was cut by half. In the last 6 years, the United States farm population dropped from 16 to 13 percent of the total population, and the farm labor force from 7½ million to 6½ million. Persons with farm backgrounds who are old enough to vote and otherwise to influence political trends represent a comparatively higher proportion of the national population because of higher birth and migration rates, but even so it is estimated that only 37 per cent of all persons in the country 25 years of age and over were born to farm parents. A few years ago, about half of the members of Congress represented states or districts in which agriculture was a dominant industry;

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but this representation is known to be declining and further decreases are expected. Our associates in the general fields of economics point out that agriculture produced only 4½ percent of the gross national product in 1956, and they sometimes add that farm income still might be reduced by half or more with no appreciable effect on the economy as a whole.

It all adds up to "who cares?"

Penn says that the Wisconsin farmer whose tractor costs him 29,000 more pounds of milk now than it cost in 1946 cares enough to join an organization that has production controls as a primary objective. Twenty-one farm commodity organizations cared enough to convene in Washington last August 6 to consider ways and means out of the dilemma. The president of one of the national farm organizations cared enough last spring to use the ugly word "cartelization" as a proposed remedy. And Congress cared enough in a presidential election year to create the soil bank.

In 1933, agricultural economists reluctantly accepted the existence of industrial price administration, alongside a free market in agriculture, as a basis for endorsing farm production controls (but only as a temporary expedient). Relapses occurred twice since, during World War II and the Korean War, when demand caught up with the remarkable productive capacity of American agriculture. These passing phenomena encouraged in the profession a revival of Marshallian techniques, with their elaborate mathematical paraphernalia.

We now find ourselves in the horse latitudes of farm policy. The wind has failed. And to a very considerable extent, the indecision that prevails places our profession and our analytical methods on trial. On the political front, some policymakers are biding their time. Their reasoning is reported to be that the farm income situation must get worse before farmers will accept the discipline necessary to enforce the type of "horizontal" control of which Penn speaks.

Meanwhile, amid a general dearth of ideas, agricultural economists have a golden opportunity to help provide a realistic basis for policy formulation. To do so will mean acceptance of the harsh fact that the classical notion of individualized competition no longer has substantive meaning outside of agriculture and is no longer practicable within agriculture. If this is the core of Penn's message, I should like to close these remarks with an "amen."

## ALTERNATIVES TO ORTHODOX PROGRAMS AND GOALS OF AGRICULTURAL ADJUSTMENT

G. E. BRANDOW

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I HAVE retained the title assigned to this paper, but I confess that I have not known quite what to do with it. It is difficult to say what is orthodox and whose notions of orthodoxy should be given most weight. The unorthodox includes perhaps a few brilliant ideas, some suggestions that contain real merit and a long list of haphazard proposals. Instead of organizing the paper around orthodoxy, I have chosen to concentrate on the manner in which the need for agricultural adjustment modifies the ends and means appropriate for agricultural policy today. The paper undertakes to show that thorough-going adjustment of agriculture conflicts with some important desires of farm people, that certain adjustments seem in a practical sense to be unavoidable, that the goals we can realistically set up as guides for farm policy in the next few years must take this into account, and that strong economic forces generated by the need for adjustment should be considered in deciding on the strategy by which attainable ends are to be achieved.

### *Conflict of Goals and Adjustment*

Adjustment implies change toward a norm. For purposes of definition, let us say that in an adjusted agriculture individual farms would be producing the products in which they had the greatest comparative advantage, farms would be of such size that unit production costs were at a minimum, inputs would be used in such combinations and amounts that marginal costs equalled marginal revenues, and both quantities of resources used in agriculture and the volume of farm output would be such that market prices enabled earnings of labor and capital in farming to be comparable with those outside of agriculture, nonmonetary factors taken into account. This is a rather clumsily expressed concept of economic efficiency in which market demands are accepted at face value. Certain parts of the definition are contained in almost everyone's ideas of what agricultural adjustment implies but perhaps very few people would endorse it in toto. Its principal merit for this discussion is that it is reasonably clear and is the norm toward which economic forces in the market tend to work, however slowly and imperfectly.

An adjusted agriculture as thus defined is an attractive norm in several ways. An adjusted agriculture by definition would be an efficient one, a matter of concern both to farmers and to the general public; farm incomes would be widely regarded as equitable since returns to labor



and capital would compare favorably with those in industry; and agriculture would be in a state of equilibrium in which no restrictive government programs or costly federal expenditures would be required to maintain an efficient and prosperous farm economy. Still, an adjusted agriculture in this sense has some important limitations as a general goal acceptable to all farm people:

1. Income would be equitable for the families remaining in agriculture after adjustment had been completed. But the number of families currently trying to make a living in farming is much larger than would be engaged in an adjusted agriculture under present conditions. Families that might be "adjusted out" have little enthusiasm for the norm.

2. Achieving adjustment when agriculture departs so materially from the norm can be a painful process even for those families that will remain on farms. A lower level of labor earnings in agriculture than in industry probably is a necessary condition for adjustment, and lower labor earnings affect all families, both those that will stay in farming and those that will leave.<sup>1</sup>

3. The requirement that farms should be of sufficient size for unit costs of production to be at a minimum is disturbing to many people who do not wish to see a change in the size distribution of farms. This point can be subdivided into two parts: (a) the desire to see the small, semi-subsistence farm continue in agriculture and (b) the desire to preserve the family farm, even though one that is growing in size and becoming more strictly a business operation. The norm clearly rules out the semi-subsistence unit. Whether the family farm is ruled out is not so clear. Although our information on economies of scale is in many respects far from satisfactory, the larger family farms still appear to be as efficient as any in many types of agriculture. In some other important types, however, this apparently is not true. The changing character of the family farm is often confused with its disappearance. In any event, the norm of an adjusted agriculture is likely to be rejected if it is thought to conflict with the cherished tradition of the family farm. Similar remarks might be made about vertical integration.

4. The norm of an adjusted agriculture is essentially a static one and can apply only to a given state of the arts and in a certain set of market demands at a particular time. But technology in agriculture is advancing, and market demands are shifting. The changes are such that the norm keeps moving away from the status quo. Adjustment appears to require persistent reduction of the labor force, enlargement of farms, changes

<sup>1</sup>This language is used as a matter of convenience. An important way in which the number of persons engaged in agriculture is reduced is the failure of young people to stay on farms to replace their elders. When this happens, no family unit as such moves away from the farm.

in commodities produced, and disparity between farm and nonfarm incomes. The prospect is discouraging, especially if adjustment works slowly and imperfectly.

5. Finally, adjustment means change. Farming is still importantly a way of life as well as a means of earning a living. Tradition and custom have a strong hold on many farm people (and on some who idealize agriculture from a distance). Any change, whether for better or for worse as judged *ex post facto*, meets resistance from some quarters.

Hence, agricultural adjustment conflicts with, or at least fails to satisfy, certain important desires of farm people. Although a well adjusted agriculture has much to recommend it, thorough-going agricultural adjustment is more resisted than favored. Indeed, a basic question confronting agriculture today is, can adjustment be avoided? Can farm people not earn satisfactory incomes farming where they are and as they are? Various forms of this question are asked insistently and reveal a deep desire to avoid several aspects of adjustment. At least a partial answer is required before ends and means of agricultural policy can realistically be considered. Lying behind the question is the hope that some form of income support can achieve farmers' goals without adjustment, or that the forces giving rise to the need for adjustment can be repressed.

#### *Income Support and Adjustment*

Income support might take any of several forms. Most frequently discussed are various methods of raising market prices. Direct payments might be used, either as compensatory price payments or as income grants. Programs executed successfully would achieve some important objectives. But certain other objectives might not be attained. Can programs to support farm income keep small, semisubsistence farms in agriculture? Can they maintain the present number of farmers and the present size of the farm population? Can they alone produce an income situation in agriculture that would be widely regarded by farmers as satisfactory?

Farmers depending for a living on clearly inadequate business units, certainly those in classes V and VI of the census economic classification of farms, cannot be given incomes closely comparable with those in industry by any feasible form of income support. Raising the level of farm prices will not do it, for the required advance in prices would be extreme, would make veritable gold mines out of the more efficient family farms, and would create impossible administrative problems. Only very high income payments directed exclusively to the inadequate farms could accomplish the purpose, and making a special group of the population the beneficiary of so large a windfall is hardly conceivable. If the

number of "low income" farms stays at the current level, it will be because the families on them choose to accept very inferior monetary incomes or because of obstacles to leaving. Statistics on migration from agriculture suggest that poverty on a small farm is not attractive, and we can expect it to be even less tolerable in the future.

If we put to one side questions of administrative feasibility and certain noneconomic considerations, it seems possible to raise total farm income considerably by production control, direct payments, or certain other devices. Is it likely that the resulting income situation would be judged satisfactory by farmers in commercial agriculture unless substantial adjustment were also achieved?

The number of farmers now seeking to make a living in commercial farming is substantially larger than would be the case in an agriculture that is well adjusted, although the excess is less striking than in areas of low income. If farm income is materially increased, market forces under these conditions will tend to allocate the added income to land rather than to labor. Would-be farm owners and tenants will be able to pay higher prices and larger rents for farms as income rises. Competition among aspiring farmers for farms will have this effect as long as families are willing to accept low returns for their own labor and capital rather than use their resources elsewhere.

The capitalization of higher incomes into land values takes place sluggishly and affects family earnings only as rents are raised or as farms are sold to new owners. A son who inherits a farm without having to pay estate shares to other children receives substantially the full benefit of the added income. But new owners who have to purchase their farms must either assume larger debts or be better off to start with. Even after a substantial increase in income going to agriculture, many commercial farm families would have little more income available for living purposes than they otherwise would have had. We would hear even more about how difficult it is for a young man to get started in farming. Quite possibly, the continued advance of farm real estate values in recent years is in part attributable to this process.

These considerations also have a bearing on the desire to maintain the family farm. Necessarily, the family farm is one in which an important part of total inputs consists of family labor. One side of this coin has already been discussed: the necessity for high family labor earnings if the income situation is to be satisfactory. The other side is that increasing the returns to land in relation to labor earnings decreases the ability of the family farm to hold its own. As the investment required in farming rises in relation to labor input, the opportunity to become farm owners is diminished for families with mostly labor to offer, and a special advantage

goes to men with money to invest and to the corporate form of organization.

As one analyzes these matters, he comes to the conclusion that the only satisfactory way to improve farm income as long as farming remains a family business is to increase real earnings of family labor and management. This will not be possible permanently and in important degree while the number of families seeking to farm substantially exceeds the number of efficient production units available. The only way in a free society to adjust the number of families seeking to farm is to increase families' capacity to employ their resources where returns are greatest. High birth rates on farms and declining labor requirements in agriculture create a natural excess of would-be farmers. How closely labor earnings in farming can approach those elsewhere depends on how effectively the adjustment process can be made to work. The most resisted kind of agricultural adjustment, reduction of the number of farmers and of the farm population, is precisely the one that is most necessary if incomes are to be satisfactory in a family-type agriculture.

### *Curbing Technological Advance*

Technology has been the principal means by which agricultural productivity has been raised in recent years, and new technology continues to come forth. Hence the suggestion is increasingly often made (though it is still unorthodox): restrict technological advance by reducing public support for agricultural research and extension, particularly in the production fields.

A well-rounded discussion of this proposal cannot be attempted here. Such a discussion might touch upon the high value placed by American society and farmers on progress, the difficulty of achieving a fine adjustment between actual technological development and some desired rate, the risks involved in having too little progress compared with the risks in having too much, benefits to nonfarm people as well as effects on farmers, and still other considerations. I shall only comment about two points that seem particularly relevant here.

The first point is the difficulty of choking off technological development in agriculture. It seems quite unlikely that complete abandonment of public support for agricultural research and extension would permanently and decisively slow down technological advance. Consider the advances we have seen in the past 30 years. The development of new and better machinery, which has been the most important factor in reducing farm labor requirements, has not been primarily a product of agricultural science. It has been mainly an application of principles being applied in

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the automobile, trucking, construction, industrial equipment, and other industries. Moreover, individuals and private manufacturers have been responsible for most of the innovations even in the agricultural field. To have prevented the mechanization of agriculture would have required repression of technological advance in large areas of industry—an impractical procedure and much too high a price to pay.

Many other innovations—improved crop varieties, better poultry and livestock feeds, improved fertilization—have been more largely centered in the agricultural sciences supported by public funds. We have seen something of the great opportunities that existed and still exist in these areas. Americans are ingenious and technically minded; it is very likely that had not public institutions made the discoveries that were “becoming ripe” in a scientific sense in recent decades, someone else would have done it.<sup>2</sup> Large profits awaited those who developed such striking new efficiencies. Publicly supported agricultural research and extension agencies were the chief instruments by which they were developed and disseminated. Had this means not existed, other means, probably somewhat less effective, would have been found. Agriculture could not have been and cannot be a stagnant pool in a surging sea of technological progress.

This has important implications for the family farm. When much of the new technology was being developed in and disseminated by publicly supported agencies, the ordinary family farmer had an excellent opportunity to stay abreast of latest technological developments. He could continue to compete, though the competition was rough. But had new technology been developed privately, the results might have been different. Large farms capable of hiring technically skilled management and doing some of their own experimentation would have had an important advantage over the family farmer. A stronger inducement would have existed for integration of farms with industrial firms. An additional burden would have been placed on the family farm in its effort to survive in an era when technical know-how has been increasingly decisive for successful farming.<sup>3</sup>

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<sup>2</sup> This was probably less true in the days when public support of agricultural research was first started.

<sup>3</sup> The comment was made earlier that rising investment requirements in relation to labor inputs in farm production are a handicap to the family farm. Technology has much increased the amount of machinery and equipment used in farming and the amount of land and livestock one man can handle. Offsetting this in part, however, has been the tendency of technology to bring about a declining economic importance of land (as the author of this phrase, T. W. Schultz, has shown). Technology has, in a sense, stretched out the supply of land, making its price lower than it otherwise would have been.



*Re-shaping Policy Ends and Means*

It might be argued—as it often seems to be—that goals are absolutes, independent of means; that one goal is on the same footing with another regardless of attainability. If this were the case, the desire to maintain semisubsistence farms in agriculture and to keep the number of farmers and the farm labor force at their present levels would be as appropriate goals for agricultural policy as any other, subject only to value judgments as to what is good and bad.

But the situation is not that simple. Most of the goals in farm policy are not really ultimate goals. They are means to more basic objectives, and perhaps for purposes of this paper it is sufficient to say that most of them are encompassed in the general goal of human happiness. A goal from one viewpoint is usually a means from another. Moreover, immediate goals or ends in view for farm policy are by no means all equally attainable. This needs to be considered in deciding what we shall try to accomplish with farm policy. Ends and means must be considered together. The process is an exercise in strategy in which selection of goals is indeed conditioned by value judgments but is also much circumscribed by attainability of goals.

In this sense, then, maintaining the very small farms, the present number of farmers, and the current farm labor force in agriculture are not appropriate goals for agricultural policy. They are goals that are not attainable, hence not relevant to choosing among alternatives. To insist upon pursuing policy thought to be capable of achieving such goals can only warp farm programs and assure frustration. Such policy is likely to be ineffectual both in helping people with low incomes to improve their own and their children's fortunes and in helping farm families with a real opportunity in agriculture to deal with problems on the farm.

Thus, some goals that many farm people highly prize cannot be included among the things we are trying to with agricultural policy if that policy is to be realistic and effective. Rather, the reverse position must be taken: assisting people to recognize and to make best use of their opportunities on or off the farm needs to be given an important place as an immediate farm policy objective. To repeat, this substitution of a purpose that is often resisted for others that are frequently prized is not a matter of value judgment. It is based on a recognition of the possibilities inherent in the current agricultural situation and on the simple fact that strategy directed toward unattainable ends is fruitless.

Other and familiar goals properly have a very important part in the shaping of farm policy. Three of these might be called the eternal triangle of farm policy affairs: efficient use of resources, higher farm incomes, and freedom and independence for farmers. Several aspects

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of efficiency have already been discussed in connection with the need for agricultural adjustment. Farmers will seek to realize higher incomes than the low level likely to be attainable in free markets in the next few years and, if means are well chosen, can succeed within limits. Farmers will also prefer to farm as they think best and to be independent of Treasury payments for their livelihood. But no means are available by which all three goals can be simultaneously attained here and now, and controversy will center on them for a long time. Preserving the family farm, a goal that has been more talked about than actually applied in the past, is likely to have more direct bearing on policy decisions in the future.<sup>4</sup>

When we turn to programs suited to achieve farm policy goals, too much emphasis can hardly be placed on programs for agricultural adjustment if the present imbalance is to be redressed. Two broad kinds of adjustment programs are needed: first, to assist farm people, especially the oncoming generation, to enter nonfarm employment where this is their best opportunity; and, second, to help farmers who have a reasonable chance of success in agriculture to adjust to changing markets and methods of production. Both have received a good deal of attention from agricultural economists, and at least five of the section meetings of this year's annual meeting bear directly upon them. In practice, both have been neglected, especially labor transfer programs. In actual policy making, we as a public have clung to the hope that adjustment will not be necessary, have been dismayed by the difficulties involved in labor transfer and, in a day when *laissez-faire* is under heavy attack, have left largely to the price system a kind of adjustment it handles least effectively.

Programs to improve farm income will be near the center of the stage even if adjustment programs are given the prominence that the need for them requires. The underlying adjustment problem of agriculture has important implications for income programs, however. Measures to expedite adjustment must be thought of as necessary accompaniments to income programs rather than as unrelated or alternative undertakings. As long as the lack of adjustment is great, it will importantly limit the expectations that we can reasonably have for income programs. The administrative workability of income measures will be much influenced by the extent to which they are consistent with adjustment. If continuing adaptation of agriculture to its markets and to the technology of produc-

<sup>4</sup> Measures to encourage the family farm may create acute schizophrenia in farm programs unless a clear view is maintained of the strategy of ends and means. For example, limitation of payments to individual farmers under the soil bank program will only tend to defeat its production control purposes while reducing the operations of family farms more than those of very large farms.

tion is blocked, strong pressures tending to break down any program will accumulate. Finally, the exact progress of forces bringing about adjustment and the circumstances under which they will operate cannot be predicted in detail. Hence, income programs that have the capacity to adapt to unforeseen circumstances are likely to be more successful than those requiring detailed foreknowledge of future situations.

### *Concluding Remarks*

Some of the conclusions of this paper are familiar to the point of being trite. If there are any agricultural economists who think that good incomes can be obtained on semi-subsistence farms or that maintaining the present number of farmers is consistent with achieving generally satisfactory incomes in agriculture, they are a very small minority. But this does not mean that such conclusions are commonly accepted in the process of policy making. It would represent a substantial gain if unattainable goals could be resolutely set aside and not permitted to confuse meaningful issues. The door would be opened to vigorous programs to increase off-farm employment opportunities for farm people, and programs of income support for farmers could be more realistically developed and evaluated.

One of the most certain things in life is that agriculture is going to continue to change under the enormous impact of forces at work throughout the whole economy. The art of successful policy making calls for discerning in forthcoming situations those circumstances most satisfying to our basic values and for shaping future developments toward such ends. In the next few years, we are going to have to live with agricultural adjustment, to recognize the limitations it imposes on what we might otherwise try to do, and to steer toward a new but still desirable farm economy.

My closing comment is that perhaps we fear adjustment too much. How many present-day farmers would really prefer to live the life of the Golden Age of 1910-14? How many of the 20 or 30 million<sup>5</sup> people who have left agriculture in the past 20 years would prefer to go back? Do the families still farming want them back? Adjustment, *ex ante*, may be forbidding; but adjustment, *ex post*, is not so bad. Nothing demonstrates the latter more effectively than American society today.

<sup>5</sup> 36,000,000 people migrated from farms (or their residence was reclassified as nonfarm) between 1936 and 1956; 19,000,000 migrated to farms; and the difference was 17,000,000. (*Farm Population: Migration to and from Farms, 1920-54*, AMS-10, December, 1954, and *Farm Population Estimates for 1956*, AMS-80 (1956), August, 1956; United States Department of Agriculture.) The number of people who migrated in one direction at one time and in the opposite direction at another time is not known. Probably the number who left farms and did not return was between 20,000,000 and 30,000,000.

DISCUSSION: ALTERNATIVES TO ORTHODOX PROGRAMS  
AND GOALS OF AGRICULTURAL ADJUSTMENTHAROLD G. HALCROW  
*University of Illinois*

Instead of discussing specific and unorthodox solutions to farm income problems, George Brandow has outlined a general framework for analysis of income programs and has concluded that most if not all programs having the objective of higher farm incomes run counter to important beliefs and values. Certainly as far as production control programs are concerned, there is much to support this view. As a general rule, as far as policy is concerned, allotment programs have been relatively ineffective in limiting total output. The fact that they have not been made more effective though strict cross-compliance regulations, which would involve heavier payments, merely substantiates his point. We *could* control output, however. For instance, the terms of trade could be made more favorable to agriculture by a heavy tax on commercial fertilizer or on some of the modern insecticides, or by raising the interest rate on farm loans. But proposals to take such "unorthodox" steps are not seriously considered. Quite obviously such proposals are the exact opposite of current policy.

The heart of the farm income problem is one of labor transfer. Here the alternatives to current policy are many. Instead of half a billion dollars a year for a soil bank, would not more progress be made by appropriating the same funds for a "man bank," to help farm people transfer to nonfarm employment? The idea has important income and conservation implications. Again, however, as Brandow suggests, important beliefs and values intervene. Nevertheless, I believe that proposals to create greater labor mobility would receive considerably more support from farm people if the necessary steps in agricultural adjustment were spelled out with greater clarity.

We could discuss many programs under the topic assigned. The plan to put the whole farm in the soil bank would surely be an appropriate one; and this plan does have important innovations. For a given expenditure, a considerably larger acreage could be attracted into the soil bank than under the current program. More important from an adjustment standpoint, the farm family would be free to seek other employment.

The whole problem of storage policy and the question of food reserves should be given more emphasis in light of the new potentials in the military field. What is an appropriate storage policy for the highly undesirable contingency of World War III? In our preoccupation with surpluses and production control programs we may be overlooking one of the most important questions of all.

Brandow might have taken this opportunity to outline and explore specific programs which could be offered as alternatives. The fact that he did not do so somewhat limits our discussion. He closes with the comment that perhaps we fear adjustment too much. The fact is that adjustment for most farmers requires considerable capital outlay. Frequently, credit sources do not go far enough. Financing a fully modern family farm is one of our really basic farm production problems. There is no quick and easy solution. Open-end loans, and loans in which the capital is not reduced, or is reduced at a very low rate over a period of say 50 or 60 years, are worthy of exploration.

Agricultural economists are faced with an important challenge in the area of economic education pertaining to the adjustment of agriculture to economic change. The necessity for change is brought on chiefly by the rapid rate of technical development. Extension budgets should be greatly enlarged. The urgent need is for more emphasis on farm planning and on ways of financing efficient and fully modern farm units. Qualitatively at least we know the direction change should take. We have known this for years. But we need more research on production functions, economies of scale, and labor incomes on various sizes and types of farms. We need more research on the capital problem. We need to apply this research on capital and finance to the creation of well-balanced and efficient family farm units. We need to lay even greater emphasis on really intensive extension programs.

Although this may seem like the extreme in orthodoxy, the acceptance of any sound alternative to current programs requires a thorough knowledge of the economic problem on the part of those affected. Economic education is crucial. We must meet this challenge, and as we do, we will be in a position to consider more fully and successfully the alternatives to current programs.



## CAUSES AND EFFECTS OF PRICE VARIATIONS FOR LIVESTOCK

Chairman: H. G. Hamilton, University of Florida

### EFFECT ON THE MEAT PACKING FIRM OF SHORT-RUN PRICE VARIATIONS IN LIVESTOCK

ELLIOTT S. CLIFTON

*John Morrell & Co., Ottumwa, Iowa*

IF THE question, "What is the effect on the meat packing firm of short-run price variations?" were asked me directly, I would reply, "It depends." Today I would like to discuss with you some of the things upon which it depends and how our firm reacts under given situations to this change.

To fully understand what would happen to the firm when the price of any input changes would require complete knowledge of the structure of the industry, as well as the firm. I doubt if many people know all of the relevant factors involved in these structural relationships. In fact, I do not think that anyone has even a reasonably good estimate of the parameters of the factors they do recognize.

When first assigned the job of preparing this report, I wondered if one could determine these structural relationships. If so, then by applying changing prices to these structures, one could show what the logical reaction would be for the firm under certain conditions.

The big problem was that I had to know enough about the industry and the relationships involved to construct such a model. When I was a college professor, I thought that I knew enough about the packing industry and research methodology to conduct such a study with ease. To my chagrin, I have learned that this so-called knowledge might more appropriately be labeled "ignorance and conceit."

I would like to discuss with you some of the characteristics of the economic tools that we have and the difficulty that the packer has in applying these tools. In doing this, it will be necessary to mention some of the characteristics of the meat packing industry. Then I would like to talk specifically about three sources of price variation as a framework for deciding what action the firm will take in response to a change in livestock prices. After this, I want to discuss two situations where prices change and show how our firm would react to the price change.

#### *Factors Related to Analysis of Management Decisions*

I will use the effect on the firm and on management decisions interchangeably. The effects on the firm of a price change are the management

decisions made in response to this change and the implementation of these decisions.

*Economic theory is not sufficient for all management decisions.* We all know that economic theory has not yet reached the point where we can apply it as a structural framework for management decisions. Both the static and dynamic theories (which I choose not to attempt to define) are such that they ignore the major problems of management. Such things as the acquisition and control of capital assets, growth or expansion of the firm, substitution of technology for other factors of production, etc., are not covered by the present theory.

The structural relationships at any given time are of importance to management largely as a point of departure. Most management decisions are concerned with making decisions to change the structure.

*Economic principles are useful in analysis of some management problems.* I do not want to minimize the use of economic principles as a framework for making decisions in those instances where the specific application of economic theory is fruitful. These areas include such problems as choosing among alternative combinations of resources in production or the selection of a product where the resource ownership patterns and income distributions and other managerial decisions have already been made.

Before anyone says that packers do not have regard for economic principles and analysis, let me make it clear that we attempt to use all of the economic tools that economists have devised. This is not to state that we use them correctly. If one could assume that other things would remain constant, then the effect of a livestock price change on the firm could be analyzed by doing a comprehensive study of the firm with sharply changing variable cost structures. To approach the problem in this fashion would be misleading.

*The packing industry is imperfectly competitive.* Much of the packing industry operates in a framework of imperfect competition. Supply and demand curves for the plant are less than perfectly elastic. Any action taken by the firm must be considered in the light of its effect upon the competition and their reaction to the move. When packers sell their products, they find that the buying forces are also imperfectly competitive. Each large chain buyer must consider his competition when purchasing his meat requirements. As you all know, when an imperfectly competitive buyer faces an imperfectly competitive seller, the price becomes indeterminate because of the discontinuity of the marginal revenue and cost curves. The price then becomes a negotiated price settled on the basis of the bargaining power of the opposing forces.

*Buyers control majority of bargaining powers.* It takes very little other

than a look at the relative profit and loss statement of the packers and large buyers to determine that the buyers have the majority of the power in this bargaining situation. A store sells many products and to a large degree can regulate the flow of many products by altering shelf space. A store can play somewhat of a waiting game in purchasing meat. On the other hand, the packer produces one product for sale (meat) and he must sell it quickly because of its perishability.

Any action that tends to increase the elasticity of demand (increase the substitutability) for a product will tend to shift the bargaining power from the seller to the buyer at both the wholesale and retail levels. Government action such as grading, labeling requirements, minimum ingredient requirements, market news, etc., all tend to favor the buyer at the expense of the seller. One solution to these problems may lie in vertical integration. When the opposition gets the balance of power in the bargaining process, the best way to recapture this potential source of profit is through integrating the firm vertically. Many observers think that the time is rapidly approaching for many industries when vertical integration is essential for survival. Such action will have very wide political and social effects.

*Firms do not operate in the short run.* All short-run decisions must be analyzed in the light of long-run plans. Consider two firms for example. One decides that over the long run it will expand in proportion to the increase in livestock and population. In other words, maintain the status quo. The second decides to expand immediately at the expense of the competition. These two firms would react quite differently to given situations. A reduced net profit might well cause the first firm to retract its volume of operation, trying to increase its margin and profit position. The other firm might expand volume with less concern over the profit or loss in the short run on the assumption that the probability of success is compatible with affinity to assume the risk. Profit in the short run is sacrificed for growth and potential profit in the long run. One might just note in passing that as long as many firms in the meat packing industry are more concerned with their proportion of the total business than their profit position, there is going to be a great deal of stress on the short-run profits of all packers.

Another long-range decision that affects the industry greatly is that of purchasing and slaughtering all livestock offered for sale any day, week or month. To accomplish this, firms are constructed and equipped to operate over wide ranges of volumes. This has a large effect on the cost structures of the firms and consequently influences how they react to a price change for livestock.

### Sources of Price Variation

I intend to get more specific in the discussion of problems by examining (1) the demand structure for the firm and its characteristics, (2) the supply structure and some of its characteristics, (3) livestock price changes and some of the sources of price change, and (4) the plant's reaction to a livestock price change due (a) to change in product prices or livestock numbers and (b) to change in demand due to the cost structure of the processor. Equating marginal cost to marginal revenue is the goal to be achieved. The difficulty of locating this point and the variability in the point itself over time constitutes the real subject matter of this discussion.

Most production firms take many raw materials and produce a few products. The meat packer, on the other hand, takes a few raw materials and produces many products. The input-output relationships are fairly complex. Vertical integration causes problems of pricing factors and products for each stage of the operation. Small changes in product prices often dictate large changes in the optimum operating schedule and product flow through the plant. This requires flexibility for the firm, but firms are finding the area of flexibility constantly reduced.

*Demand for the carcass.* The value of the animal at the wholesale level is set forth as the sum of the value of the individual cuts of the carcass. Stated mathematically, this would be

$$Y = \sum_{i=1}^n \frac{P_i X_i}{W} \times 100$$

Where

Y = value of carcass per 100 pounds

P = price of cut

X = weight of the cut

W = weight of carcass

i = individual cut

Price and weight of cut are not independent. The place the packer puts his knife in the cutting operation depends on relative prices of various cuts. If the price of loins is high relative to the price of hams, for example, loins will be cut long at the expense of hams. The degree that this is practiced depends on the individual firm.

*Conversions.* Each cut of the carcass may be used in many ways. The analysis of how each cut should be directed is called "conversions" in the trade. Conversion involves the input-output relationships where the individual cut becomes a factor in production of different items. For example, heavy loins can be converted into Canadian loins, boneless loins, smoked loins, etc. Thus the above value equations has another equation within it for each item. To find the optimum value requires one to solve simul-

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taneously the conversion equations and the value equation with the restriction that the value equation be a maximum. Since the conversion data are necessary for the plant flow, we do compute many of these daily and adjust to the changes whenever we feel that the price differences are large enough to justify the change.

*Wholesale prices are used for value determination.* The value of the carcass, however, is usually determined by the wholesale prices of the cuts and not by using the realized or expected sales prices. This is the cutout test. This test usually directs the purchasing program (which includes the product mix of weights and grades that appear most favorable) and the level of operation. It is probably the most misused of all the data packers have available to them. One misuse involves the computation of marginal revenue.

*Demand for cuts is variable over time and varies greatly within the year.* My experience is that about one month is the longest time period one can consider the demand function for a cut as a constant. The changing product prices in periods longer than that seem to be a combination of shifting demand and supply.

For the individual firm the realized price of a cut is often a function of the demand structure the firm has created through advertising, promotion and quality control, as well as through such factors as distribution methods, plant location, etc. All of these factors must be considered as relevant in a short-run analysis even if we were considering only an equilibrium point at a specific period of time.

The firm cannot afford to consider present sales prices and/or the demand structure as a constant. Here again, the firm can alter the demand for its products and only when the increased revenue from advertising is equated to the marginal cost of advertising is the optimum demand structure obtained for the firm. Such a point is practically impossible to locate but some estimate of it is essential for any firm. These factors greatly affect the level of the demand curve for the firm's products and tend to change its slope. I believe that most firms operating today, regardless of their size, will find that the slope of their demand curve is downward no matter what product they sell. A packer can sell increasing quantities of product by reducing the price or increasing the cost through demand creation or by some combination of the two.

*The demand for live hogs.* Packers cannot take the value of the cuts from the carcass, deduct an operating margin and pay the residual to farmers. The price paid depends on the *expected* marginal cost and marginal revenue at the various levels of operation. The marginal cost can be separated into two components: livestock costs and plant operating costs. The plant operating costs and their relationship to volume are extremely



important in setting livestock prices when the supply of livestock is short. To a large extent, the changes in processing margins are a function of the cost structure of the firm. One long-range decision of the firms in the industry has been that they would build capacity to kill all the hogs offered for sale on any given day or week. To do this, they built plants with excess capacity for most of the year. Also, the packing firm must guarantee hours of work. That is, if an employee starts to work at all in a week he must be paid for 36 hours. The crux of this and related situations is that the firms have high fixed costs and relatively low marginal costs. Packers think that they have to produce at capacity to cover a part or all of their overhead. Often this desire is labeled in the industry as the competition for tonnage.

When I taught economics, I had a most difficult and trying time in attempting to convince students that the fixed costs do not enter into the volume decision. Perhaps it was the inability of the teacher to sell this item because I have the same difficulty with businessmen. Anyhow, with very low marginal costs, economies under pure competition would dictate that if the firm operates at all it would produce at capacity. Often this is the decision of the packing firm. Managers do not remember that increasing the purchase price of livestock will not increase the supply except possibly in the very short run. Also one would think that the sales force would get a larger margin from a smaller quantity of meat. Thus, increasing volume has a two-sided effect. It increases marginal cost and reduces marginal revenue. So the volume decision must consider the cost structure in connection with these other two and not let the reduction of operating costs be the sole criterion of the volume decision.

Much of the seasonal price change in hog prices is due to changing processing margins. For example, on a live basis the processing margin in December of 1955 was in the range of 2¢ to 3¢ per pound and hogs were 10¢ per pound, but by March hogs were 14¢ and the process margin was a minus 1¢, so three-fourths of the price change was processing margin and only one-fourth was changing demand and supply for the cuts.

When slaughter passes the 36 to 40-hour level, the packer will attempt to stretch processing and slaughtering margins enough to cover all costs and then enough more to make a decent profit, including enough to offset the loss during the shorter supply period. This contributes greatly to the price fluctuations.

Although I have discussed the problem associated with paying penalty time due to slaughter falling below the 36-hour level, similar situations occur in many aspects of the operation. These include such problems as changing the rate of kill or the adding or dropping of a second shift. A firm may let the processing margins become very low before changing gang size or dropping the second shift. Also a firm may let margins get

fairly large. Packers tend to have a declining

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fairly large before increasing the rate of kill or adding the second shift. Packers tend to make money on an expanding slaughter and lose money on a declining slaughter no matter what the level of slaughter.

Storage operations used to be a safe means of covering losses, but production has leveled out somewhat and the demand for pork products in the summer has declined. If one stored all the primal cuts from December to June or July for a shortage operation, one would find that about 50% of the time the storage operation would lose money. The storage operation must not necessarily lose money. Usually one or more of the cuts will make a storage profit. If this were not so, the use of economists in the industry might be reduced. Livestock prices are based on anticipated marginal revenue and marginal cost, not only because it is in the future, but also because we do not know either the marginal cost or marginal revenue at any time.

*Marginal cost difficult to compute.* Marginal cost of adding or reducing volume is almost impossible to compute. Due to the plant seniority aspect of union agreements, a reduction in the working force causes personnel to shift jobs through the bumping process. Thus you may wind up with your skilled butchers in loading or something and loaders doing the butchering. The cost of training a new man includes the cost of product damage as well as the salary paid. A layoff of a skilled person may well result in having to train a new one to replace him when the job is reopened. The net result of this situation is that often the gang size and rate of kill is maintained and penalty time is paid for hours not worked in preference to reducing employee numbers and rate of operation per hour.

Not all packers will compute marginal revenue directly but most firms have somewhat of the marginal concept in mind. Using the kill and cut statement for marginal revenue is often misleading. When numbers of livestock are short and there are few sales of green meat, those processors whose plants do not kill hogs must run their input prices up to obtain the raw materials for manufacture. Thus, they are operating at a loss but are more than covering out-of-pocket costs so they continue to operate. The rest of the packing industry may be figuring operational level on the basis of the green prices instead of processed prices. Thus they may be even expecting to make profits but find that the money credited to the kill and cut department was more than offset by losses in processing and sales.

Still some packers look only at a single item—pork loins—when thinking about the marginal revenue. An advance in the loin market will induce them to increase the prices paid for hogs with little regard for the other cuts. Other cuts will be cured and they may be higher by the time they are sold. The reaction of the firm to a price change in livestock depends on the circumstances under which the price change takes place.

### *Supply of Livestock*

In the area of supply we are generally in a dither. In the short run, we often consider supply fixed. Then again, we figure that the supply is elastic in the short run and that higher prices will increase receipts on a given day. I have been greatly impressed by the inverted slope of the supply curve in the short run under certain circumstances. So far as the over-all supply of hogs is concerned, an increase in prices tends to reduce supplies during periods when numbers are short and prices are expected to increase. When there is a heavy supply and prices are expected to fall, a price increase will increase receipts.

We probably know less about the supply function in agriculture than any other single aspect of our business. From statistical data (such as births or numbers on farms) it is possible to forecast with a fair degree of accuracy the receipts at some future date but we really know very little about the supply functions.

As far as the individual firm is concerned, in the short run it must consider each day and each week as a somewhat independent decision in setting its operating schedule. The supply curve for the firm is usually such that one can purchase a larger number of hogs only by increasing the cost of the total buy. Thus the marginal cost of buying hogs is extremely large in the summer when the supply is short. It is smaller when supplies are large.

### *How the Firm Reacts to a Change in Livestock Prices*

In general the firm's reaction will be determined largely by the source from which the price variation arises. If the price change is due to interaction of consumer demand and the supply, the firm may not react at all. If processing margins are satisfactory and livestock numbers increase and prices decline, the firm will re-evaluate its profit position by estimating (1) the marginal cost of purchasing more hogs, (2) the net margins that will be incurred at a larger volume of operations, and (3) the change in cost structure associated with these changes. If increased cost of hogs and decreased revenues are not enough to overcome the decrease in operating cost and in the total profit, the firm will increase the kill schedule. But the demand and supply could easily be such that neither margins nor levels of operations would be greatly affected.

Suppose we have the reverse of this situation and slaughter decreases below the critical point and penalty time must be paid. This price change is one of changing processing margins and not one of demand and supply fluctuations in a strict sense. The first impact on our individual firm is surprise at the competing firms that apparently follow the dictates of economic logic under assumptions of pure competition. Apparently the competing firms think that they can increase the percentage of livestock

purchased by a small price increase. Thus, they will avoid paying penalty time. After this reaction of surprise our firm looks at the supply situation and decides how much can be paid to avoid penalty time and joins the parade to increasing livestock prices at the expense of operating profits.

I have been able to tell you only the direction of movement when the price of livestock changes. The measurement of the degree of the movement must await a more precise attack on the problem by someone with more time, talent and resources than I have.

I suppose you have surmised by now that many of our problems center around the conflict of interests between the industry and the firm. This phenomenon of the industry and the firm's objectives being in conflict is certainly nothing new to agricultural economists. We have looked at this problem of excess capacity, low marginal costs, high fixed costs, etc., for many years. The obvious answer to that situation—I have been told by many economists—is quality and quantity control, cooperation among farmers and for farmers to disregard their individual objectives in favor of industry objectives. Even with the federal government helping in this collusion, the farm situation has not been solved. Personally, I hardly expect the packing industry to be able to solve their problems any more effectively when the government agencies are fighting among themselves for the power to prosecute the packing industry in the event they should even appear to be in collusion.

However, there are some economists who, for one reason or another, apparently have failed to see or understand this basic problem within the packing industry. Yet, they have posed as experts in this area. I hardly think that I am entitled to be critical of these people because I have shown that I do not understand all of the economics of the industry either. It is not difficult to be critical of any industry or individual because one has to have neither capital nor ability to set up in business as a critic.

Most of us seem to have a fear of anything that we do not understand. If we do not know what is going on and cannot find out, we tend to feel that there is something "bad" about the operation. You will find this trait somewhat universal. I believe that packers' opposition to researchers in the past may have contributed to the feeling among research people that there is something "bad" about packers.

I sincerely hope that today I may have been able to remove the industry a little farther from the sphere of the unknown. The industry can prosper only by increasing size and efficiency, providing better management and by reorganization such as vertical integration.

Any alternative forced upon the industry by overzealous proponents of the small, the inefficient and the government controlled will come only at the expense of resource waste. Anyone suggesting this type of industry



should realize fully the price they are asking society to pay for it. Whether or not the benefits from such inefficiency are worth this cost is a matter of judgment. Whatever one's opinion is on this matter, certainly he cannot but agree that over the long pull this inefficiency will be paid for by the producer. The consumer does not have to bear the cost. He will merely shift his consumption pattern to other products.

#### DISCUSSION: EFFECT ON THE MEATPACKING FIRM OF SHORT-RUN PRICE VARIATIONS IN LIVESTOCK

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Those of us who knew Dr. Clifton professionally while he was at Iowa State have always known him as a skillful craftsman. He has not disappointed us here. In this case we should be especially grateful to him for giving us a rather interesting and frank discussion of problems in decision making within the meatpacking industry and for showing the way economic theory can and cannot be used in assisting the decision maker.

I too had difficulty in college teaching with the notion that fixed costs do not enter into the volume decision. My teaching experience stretches farther back than Clifton's, and at this vantage point I feel more sympathetic toward the student. But of course the distinction between fixed and variable costs is an arbitrary one. In the long run all costs are variable. In the immediate short-run situation, all costs are fixed. I doubt that management can ever divorce itself from the long-run point of view.

Clifton has detailed the problems in marginal analysis within the packing industry very well. It does not work as well as it does in the classroom. In building up our marginal analysis we usually start with continuous physical product curves. We flip them upside down, stick in some constant factor costs and come up with a perfectly elegant cost curves. Unfortunately, the primary factor costs, livestock, are not constant, nor are the demand schedules. It is a little futile to even try to determine the points of intersection when the curves are constantly moving up and down on the blackboard.

Yet the marginal concept is perhaps the basic consideration in many managerial decisions. Will the added cost be paid for by the expected returns? That is the essence of marginalism.

In our costs and margins studies on pork we have been aware of the fact that a portion of the seasonal price change has been due increasingly to changing processing margins. With increased marketings of hogs in the fall, packers of pork have to expand their hog kill. This requires



more hours of work per week and results in overtime pay. Now in this situation, packers have no problem in obtaining the supply of hogs they need. They have a relatively low marginal cost for hog procurement, but they often have a problem in handling all of the hogs that are delivered to them. Packer-wholesaler spreads become wide in the fall as farmers begin selling their spring pigs in sizable numbers. The marketing margin behaves as though it were a price for marketing services, and this price is determined by the supply and demand for marketing services. Large hog marketings represent a high demand for marketing services. The supply of marketing services, which is made up largely of plant facilities and labor, is inflexible in the short run, especially in these postwar years of high levels of employment.

With the high demand for marketing services and the restricted supply of plants, labor, and equipment in the short run, the marketing margin or the price for marketing services tends to be rather high. The opposite situation is true when hog runs are light. Clifton suggests that the meat-packing industry has become increasingly inflexible. The increasing pattern of seasonality in hog marketing margins tends to bear this out. A study in North Carolina by J. C. Williamson indicates wider seasonal fluctuations in marketing margins—or the price for marketing services—in this area than in the Corn Belt.

Does this notion of the "marketing service" element of packer operations, its "price" and its costs, offer possibilities for marginal analysis? With this approach, the problem of changing livestock costs and meat prices would be circumvented. Marginal analysis would only be applied to that portion of the value added by the packer.

I would like to examine for a moment Clifton's point that buyers (retail stores) control the majority of the bargaining power vis-a-vis the packers. I really doubt that many retail stores feel that they can play a waiting game in buying meats. Retail stores cannot afford to play off meat against other products. Most of them use meats as their staple item to draw customers into the store. Perishability of meat is not limited to the packing house. Meat is even more perishable at the retail store after it has been disassembled into retail cuts.

Clifton's statement that government action, such as grading, labeling requirements, minimum ingredient requirements, market news, etc., all tend to favor the buyer at the expense of the seller strikes me as somewhat curious. Both grading and market news have something to do with that unrealizable ideal, "perfect knowledge," which is important in the concept of the perfect market. Before the initiation of market news and grading, meat packers were in the very enviable position of knowing more, both about their product and more about the forces of supply and demand in the market place, than either those from whom they bought,

or those to whom they sold. One could hardly imagine any more ideal bargaining position. Market news and grading have tended (1) to provide more information to all parties to the trade and (2) to more nearly equalize the level of information between buyer and seller about the article being traded. Both market news and grade standards provide the means for enlarging the area of informed and intelligent decision making in buying and selling. As such, they enable the pricing system to become a more effective means of communication by which productive resources are channeled more accurately to satisfy the preferences of consumers. This is a function of the free market which packers should be the first to extol.

Now it must be undeniably frustrating for meat packers to have lost the bargaining advantage inherent in the possibility of exploiting ignorance, the ignorance of the other party to the trade. Large merchandisers want to standardize the products they sell in order to insure as much repeatability as possible. Quality is no longer negotiable. Negotiations are restricted to price.

Clifton's comment about the government agencies fighting among themselves for jurisdiction to prosecute packers for collusion compels me to straighten out the record. This might create the impression that larger packers are very much opposed to the Department of Agriculture. Actually, I think it is fair to say that the larger packers now feel more kindly toward the Department than ever before. Relations of the Department with the Federal Trade Commission are most excellent. The Department took almost a year before it decided on what position it would take relative to the proposal to transfer the functions of regulating the packing industry to the Federal Trade Commission. The attitude of the FTC, on the other hand, has been one of casual indifference—but it is willing to take on the job. As a matter of fact, most of the argument has been within the packing industry. The trade association representing the larger packers is quite happy with regulation under the Department, one of the two smaller trade associations is neutral, while the other would prefer to have the regulatory functions transferred to the FTC. The remainder of the food industry in general is also in favor of the transfer. They have regarded the regulatory prerogative of the Department of Agriculture to actually consist of an exemption from regulation for meat packers.

I really believe that Clifton and the other economists of meatpacking concerns should be happy that there is a conflict of interest between the industry and the firm. While this conflict is evidence of the presence of competitive influences in the industry, its absence would be the surest evidence of monopoly.

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## PRICING OF CATTLE AT SOUTHERN AUCTIONS WITH EMPHASIS UPON FACTORS AFFECTING PRICE AND FARMER PRICE UNCERTAINTY

JACK D. JOHNSON

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Results from a region-wide survey of livestock producers and marketing agencies made in 1950 showed quite clearly that livestock auction markets were the most important marketing agency for southern producers, both from the standpoint of producer patronage and the volume of livestock transactions. With a few minor exceptions, more than half of every kind and class of livestock marketed in the southern region was sold at local livestock auctions.<sup>1</sup> The survey findings indicated that the size of the producer had relatively little influence on whether auctions were used or not. However, producers using local outlets other than auctions tended to sell relatively smaller numbers of cattle, while cattle producers who sold through terminal public markets tended to sell lots of larger than average size.

Convenience, availability, and adaptability undoubtedly are the major factors contributing to the popularity of auctions. They are considerably more numerous than other market outlets such as packing plants, local assembly yards or buying stations, and particularly public livestock markets. Moreover, auctions are found in all of the major production areas and generally are distributed more uniformly throughout the region than any other type of livestock markets.<sup>2</sup>

Apparently auctions are well adapted to the needs of southern producers who sell livestock in relatively small numbers. Because of the major importance of livestock auctions to the livestock economy, a considerable proportion of all marketing research has been directed at finding ways and means of improving their operational and pricing efficiency.

Most of the quantitative data presented in this analysis were collected in a regional study of price-grade differentials for cattle and calves sold at southern auctions.

To a large extent, the discussion will be centered around some of the results from the regional auction study. However, it seems appropriate to include a brief review of certain research techniques that have been used in other cattle pricing studies as well as some of the more pertinent findings from those studies. As shown later, the southern auction study differs in scope and technique from the studies reviewed.

<sup>1</sup> J. D. Johnson, *Livestock Marketing in the Southern Region*, Southern Cooperative Series, Bulletin 26, July 1, 1952.

<sup>2</sup> There are more than 500 livestock auctions in the South; in contrast there are only 10 posted stockyards classed as terminal markets.

*Ideal Market Concept Applied to Auctions*

In recent studies, McPherson of Florida and Purcell of Georgia have employed the "ideal market" concept in analyzing cattle prices at auctions within their respective states.<sup>3</sup> Essentially, their technique was to assume that prices paid for cattle at the selected terminal markets approximated the "true" value of the livestock in the "ideal market." Therefore, the deviations from the price "norms," established at the terminal markets, reflected pricing inaccuracies at local auctions.<sup>4</sup> McPherson argues that prices quoted at the terminal markets located in the South or in nearby areas could not be used as the so-called "true" value price, mainly because these markets were relatively small and somewhat unorganized.

Another popular technique used in studying the relative accuracy of cattle prices has been to measure the errors made by buyers in estimating the carcass grade and yield.<sup>5</sup> Deviations from the carcass weight and the grade assigned by the federal meat grader have been evaluated in terms of carcass prices. These deviations usually are assumed to measure the degree of pricing inaccuracy. This technique implicitly assumes that buyers will at all times pay the maximum value for an animal. This assumption certainly would not always be valid in the dynamic livestock and meat industry. Moreover, factors other than grade and yield enter into the decision to buy cattle or the prices to pay at any given point in space or time. In addition, this technique would be of little use in studying the accuracy with which cattle other than slaughter cattle were priced. A quotation from Clifton's article on the Chicago hog study is probably even more applicable to the cattle market.

Prices do not affect all firms to the same extent on a given day, also this effect differs from day to day. . . . Price differentials (between grades of hogs) exist for any day and firm but they are not very stable between firms and time. . . . It is difficult to determine, with reasonable precision, the magnitudes of "price differentials" due to grade, "existing" in the Chicago market. At first glance it might appear that buyers are not paying the price differentials for the several grades that the wholesale values of these grades seem to justify.<sup>6</sup>

<sup>3</sup> W. K. McPherson, "How Well Do Auctions Discover the Price of Cattle?" *Journal of Farm Economics*, Vol. XXXVIII, February 1956.

Joseph C. Purcell, *Comparative Analysis of Cattle Prices on Georgia Auctions and Midwest Terminal Markets*, Georgia Agricultural Experiment Station, Bulletin Number 26 (New Series), June 1956.

<sup>4</sup> After adjustments were made for transfer costs.

<sup>5</sup> Gerald Engelman, Elliott S. Clifton and more recently C. D. Phillips and M. A. Schaars have reported results based primarily on this approach. For a summary of these studies see *Pricing Accuracy of Slaughter Cattle, Veal Calves and Lambs*, North Central Regional Publication No. 53, 1954.

<sup>6</sup> Elliott S. Clifton et al., "Marketing Hogs on the Chicago Market," *Journal of Farm Economics*, Volume XXXVI, November, 1954, p. 618.

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*Results From Selected Auction Studies*

Results from both the Florida and Georgia auctions showed the average difference between prices at auctions and the selected terminals was widest for the higher quality cattle. The wider average difference in price for the higher quality cattle was attributed to a small and erratic supply of such animals consigned for sale at the auctions. Prices for comparable animals in the lower grades varied more among the auctions than between the average price at the largest Florida auction and the terminal prices. In summarizing the implications of his results, McPherson states: "The inability of auctions to discover the 'true' market price of high-grade cattle may be retarding the development of the beef industry in the southeast. The large number of small auctions in the region may be depressing the price of all cattle below the price that could be obtained in larger and more efficient auctions. Finally, it may be possible to obtain a more efficient allocation of resources in an area by deliberately creating more ideal conditions."<sup>7</sup> Prices around the trend line generally were more erratic at the Georgia auctions, particularly during periods of "relatively stable prices." But, the relative price movements for the various market classes were quite different.

Price differences between the Georgia auctions and the midwestern terminals were generally widest for the higher grade slaughter steers, feeder steers and calves and lowest for lower grade female animals. Slaughter calf prices were relatively higher than prices for any other class of cattle examined.<sup>8</sup> The supposed preference of Southern consumers for lighter weight beef, in most cases, heavy calves, could be the major cause for the relatively good showing of slaughter calves.

Results from a study of 17 livestock auctions in North Carolina show that grade differences of cattle and calves were generally reflected in price differences except for the animals most heavily demanded for feeding and breeding purposes.<sup>9</sup> Williamson points out that prices varied widely between animals of a particular market class having a common breed, grade, region and season classification.<sup>10</sup> The price variability was attributed to imperfections in the market and probable errors in the classi-

<sup>7</sup> McPherson, *op. cit.*, p. 43.

<sup>8</sup> Purcell, *op. cit.*, p. 56.

<sup>9</sup> During the period covered by this study, there was considerable interest in building up breeding herds in both North and South Carolina. At a special feeder calf sale held at Danville, Virginia, in 1951, a farmer purchased a pen of light weight, good grade heifers for \$50 per hundredweight.

<sup>10</sup> J. C. Williamson, Jr., *Cattle Prices at North Carolina Auctions*. Agricultural Economics Information Series No. 51, North Carolina State College. September 1956, p. 43. The research procedure followed in this study was very similar to that of the Southern Regional study; in fact, it was considered a pilot study for the regional project.



fication of the animals. As part of the study, a comparison was made between prices of cattle and calves at the auctions and at the Baltimore and Chicago terminal markets. Except for steers and heifers in the spring season, prices were considerably lower at the auctions. For example, good grade steers were priced \$3.45 per hundredweight lower at the auctions in fall but merited \$0.44 more at the auctions in the spring; prices for utility grade cows were \$3.32 below Baltimore prices in the spring and \$5.35 per hundredweight lower in the fall.

All of the results from southern auction studies reviewed indicate that prices generally are lower at the auctions than at the terminal markets despite the fact that the areas served by the auctions are definitely deficit beef areas. Moreover, the prices at auctions tend to be more erratic around the trend line, and all studies point to the wide variability of prices observed even for animals that appear to be relatively homogenous with respect to quality and other inherent physical features.

#### *Procedures Followed in Southern Regional Auction Study*

A study of price-grade relationships for slaughter cattle sold at southern auctions was initiated in 1953. The sampling procedure followed was to stratify the South into four reasonably homogenous strata with reference to (1) the kinds and quality of cattle and calves produced and marketed in the stratum, (2) "the area pricing points" or slaughter centers to which out-shipments normally move, and (3) normal marketing practices or operational policies of the auctions. The states or areas included in the strata were:

- Stratum I: Louisiana, the lower half of Mississippi, and the southwestern part of Alabama;
- Stratum II: The southeastern part of the region, including the state of Georgia, South Carolina, eastern North Carolina;
- Stratum III: The northeastern part of the southern region, including the states of Virginia and West Virginia, and the eastern part of the state of Tennessee;
- Stratum IV: Most of Tennessee and the balance of Alabama and Mississippi not already included in Stratum I.

Within each of the four stratum, four large and four medium-sized auctions were selected at random. A medium-sized market was defined as an auction selling an average of at least 100 cattle and calves per weekly sale but less than 300. A large auction was defined as any auction that sold an average of 300 head of cattle per weekly sale. The size of market classification was introduced into the sampling plan because it was believed that the economic environment conducive to more active competition was positively correlated with size of operations measured

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in terms of volume of sales. The time covered in the study was from the fall marketing season of 1953 through the spring of 1955. During this period eight sales were observed (on regularly scheduled sales days) on each market, consisting of two observations in each of the fall seasons and two in each of the spring seasons.

Data for the individual animals sold at these sample auctions were obtained by having a qualified livestock grader visit the auction on the sales day. He obtained the market class, breed class, the live-grade estimate, dressing percentage estimate, and the price of each animal sold.<sup>11</sup>

A unique feature of this study was the fact that all of the graders used were either experienced graders working for some state agency or were senior members of animal husbandry departments within the respective states. In addition, a coordinating grader was employed for the project whose duty was to conduct grading schools immediately prior to the beginning of an observation period. He also visited each of the state graders and graded cattle independently on at least one of the sales observed. The difference between the grades placed upon the animals by the coordinating grader and the state grader were used to adjust when necessary the grade and dressing percentage estimates of the individual grader. This procedure was used to assure a more reasonable level of grading throughout the South.

Data were collected for 88,063 animals. This figure is important because the size of the sample is reasonably large and the total number of observations created quite a computational problem; in fact, without the benefit of North Carolina State's IBM 650 machine, many of the computations could not have made. But, despite the large number of observations there are insufficient observations to make a detailed analysis of certain market class and breed groups. Basic statistical procedure followed in the analysis was to fit by least squares methods a multiple linear regression equation of the form

$$Y = b_0 + b_{1 \times 1} + b_{2 \times 2} + b_{3 \times 3} + b_{4 \times 4} + b_{5 \times 5}$$

where

$x_1$  is the grade of the animal measured in numerical figures ranging from one to 21 with top prime grade assigned the value of one and bottom canner grade assigned the value of 21,

$x_2$  is the estimated dressing percentage of the animal,

$x_3$  is the live weight of the animal,

$x_4$  is the size of the market, measured as either one or two or large or small,

<sup>11</sup> Roy G. Stout, *Marketing Cattle and Calves Through Southern Auctions*. Southern Cooperative Series Bulletin 48, February 1957. This bulletin contains a complete description of how the southern regional study was conducted and also includes a very thorough analysis of the characteristics of the cattle and calves observed.

<sup>x5</sup> is a time variable assigned the value of one or two and refers to the visit within a season.

A total of 256 least squares estimation equations were calculated, representing a single equation for each breed type, market class, and season within each of the stratum. In addition to the equations, other statistics computed were the coefficient of determination ( $R^2$ ), the residual variance ( $s^2$ ), and the variance of the regression coefficients ( $b_1$ ). The value of resulting  $R^2$ 's suggests that the model used fit the data observed quite well. The amount of variation explained by the regression was significant in nearly all cases, and those that were not significant generally described a very small number of animals.

In the great majority of cases the regression equations accounted for more than 70 percent of the variation in price. In fact, in only seven cases did the regression explain less than that.<sup>12</sup>

Except that the modal value of the  $R^2$  for cows was only around .75 while the modal value for other classes was approximately .85, there was very little difference among the classes in the amount of price variation explained by the regression equation. In fact, the biggest difference in the  $R^2$  values was between the strata. In other words, the factors considered in the regression explained a much larger percentage of price variation for the animals sold in Stratum I than in the other areas, particularly than in Stratum III where on the average the  $R^2$  values were considerably lower than in most of the other areas. Nevertheless, the size of the  $R^2$ 's from these equations indicate that the model provided a very satisfactory means for explaining the variability of the animals sold at the markets.

Because of the high co-variability between grade and dressing percentage, it is quite difficult to speak of the effect of either independently. The correlation between the regression coefficient for grade and dressing percentage ranged from about .76 for slaughter calves to .89 for cows. There was some correlation between grade and weight by class and between dressing percentage and weight by class. The existence of the

<sup>12</sup> Instead of using all of the 88,063 animals observed in the regression equation, the data were reduced into a smaller set of basic observation groups in order to make the computations more manageable. Each basic group consisted of all observations for a given breed, market class and whole breed on the visit to each market. Since all combinations of these characteristics were not present at all sales, the actual number of groups entering the regression analysis was about 12,000. Each of the basic groups were, in effect, a market mean for each group of animals of a full grade of a given class and breed type sold on a given day. However, these averages were weighted by the number of animals in each one-third of a grade; and, since the average grade value of each basic group tended to vary over the range of the full grade, the grade coefficient was only one-third of a grade basis in the analysis. It is possible that this method of grouping the data may have increased the  $R^2$  values larger than they would have been had each individual animal observation been used.

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co-variability does not however invalidate the results of the regression analysis. They merely complicate the interpretation.

The number of times the regression coefficient for each independent variate was significant is shown in Table 1. It might be worthwhile to note that the number of significant grade coefficients is inversely related to the number of significant coefficients for dressing percentage in the respective stratum.

TABLE 1. NUMBER OF TIMES  $b$  VALUES WERE SIGNIFICANT AT EITHER 1% OR 5% LEVEL BY CLASS, BY SEASON COMBINATIONS, BY STRATUM AND FOR REGION, 1953-1955<sup>1</sup>

$b_1$	Stratum				Regional Total
	I	II	III	IV	
Grade	14	10	16	10	50
Dressing Percentage	3	5	4	6	18
Weight	10	5	8	8	31
Size of Market	5	4	0	3	12
Visit	10	5	4	9	28

<sup>1</sup> If all values were significant a value of 20 would be in each block (5 classes  $\times$  4 visits) or the strata and a value of 80 for the Region.

Table 2 shows the analysis of variance of regression coefficients. The grade coefficient is significant for all groupings considered. Generally speaking, a change of one-third grade would have meant an increase in price of approximately \$0.60 per hundredweight for veal calves, \$0.44 for slaughter calves, \$0.34 for steers, \$0.48 for heifers, and \$0.28 for cows. These differences varied between the various strata, as indicated by the fact that the grade coefficient for veal calves sold in area II was such that the one-third improvement in grade quality would have changed the price only \$0.21 while a similar grade change in Stratum III would have increased the price by \$0.84. On the other hand, a one-third change in

TABLE 2. ANALYSIS OF VARIANCE OF REGRESSION COEFFICIENTS: VALUES OF  $F$  WITH 171 D.F. FOR ERROR

Source of Variation	d.f.	Grade	Dressing Percentage	Weight	Size of Market	Visit
Area	3	8.1004**	2.2982	5.5862**	.4442	1.5362
Seasonal period	3	6.0077**	1.9972	.1494	1.9808	1.4992
Area $\times$ seasonal period	9	7.3323**	.8539	1.4368	1.8438	7.7152**
Breed	2	11.8774**	3.9468*	.7586	.3792	1.2004
Area $\times$ breed	6	2.6931*	1.4923	.5287	.8726	.2936
Seasonal period $\times$ breed	6	3.7719**	1.1716	2.2759*	1.4163	2.0050
Class	4	25.5201**	1.7008	4.4368**	1.5620	3.6118**
Area $\times$ class	12	34.9883**	2.2617**	7.6782**	1.0229	1.6097
Seasonal period $\times$ class	12	9.8229**	2.7557**	2.7126**	1.0593	1.4979
Breed $\times$ class	8	4.4626**	1.4827	1.0805	.3046	.4967

Source: *Pricing Slaughter Cattle and Calves on Southern Auctions*, Southern Cooperative Series Bulletin.

grade for steers sold in Stratum II would have resulted in a price improvement of \$0.53 while a one-third improvement in grade for steers sold at Stratum III would have increased the value by only \$0.12 per hundredweight. The presence of such differences are indicated in Table 3.

TABLE 3. AVERAGE GRADE COEFFICIENT BY CLASSES AND AREAS, ONE-THIRD GRADE BASIS

Area	Class					All classes
	Veals	Slaughter calves	Steers	Heifers	Cows	
I	-.60	-.60	-.37	-.48	-.23	-.45
II	-.21	-.18	-.53	-.50	-.22	-.33
III	-.84	-.46	-.12	-.60	-.35	-.48
IV	-.76	-.51	-.34	-.34	-.24	-.44
Southern Region	-.60	-.44	-.34	-.48	-.26	-.42

Source: *Pricing Slaughter Cattle and Calves on Southern Auctions*, Southern Cooperative Series Bulletin.

Space will not permit presenting all the results. The more significant ones have been shown. Further work is underway on the regional study generally and Stratum III specifically. For example, preliminary investigations in Stratum III have shown that where farmer purchases account for a sizable proportion of a given class, or grade, price variances are increased.

#### DISCUSSION: PRICING OF CATTLE AT SOUTHERN AUCTIONS WITH EMPHASIS UPON FACTORS AFFECTING PRICE AND FARMER PRICE UNCERTAINTY

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My understanding is that discussants of papers have several alternatives in presenting their comments. They may violently disagree with the speaker, they may back him 100 per cent, or they may simply acknowledge the fact that he has given a paper, and then strike out on a tangent of their own. Frankly, I do not know where in this array my comments belong.

Not having had an opportunity to thoroughly digest the paper, my comments will suffer from the misunderstandings of first impressions.

In the first place it is difficult to discuss a paper of this sort, which in spots is rather heavy with a technical description of some statistical computations that have been made. Looking at the paper in isolation, as it will appear in the *Journal*, I get the feeling that if the questionnaire were available to the reader it would help answer some questions that might

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pop up in his mind. In reading a presentation of material of this kind, I keep three things in mind: this is what we did, this is how we did it, and this is why we did it. The "what" is adequately covered here. The "how" is sometimes too brief, and the "why" needs considerable bolstering.

Let us get down to the substance of the paper, which I think revolves around the regression equation of price and five associated variables. Three of the variables, i.e., weight, time factor, and size of market are pretty much objective factors, although market size is arbitrary. At least these three can be measured easily and accurately.

On the other hand, the grade and dress-out factors put into the equation are those of impartial observers. They may have been experienced graders, but were their estimates the same, or close enough to those of the buyers who were bidding the prices? I think there is an assumption here that they were, but personally I would like to see a little more evidence along these lines. I shall be particularly interested in the investigations Mr. Johnson mentions at the end of his paper, i.e., examination of the data to find out if different types of buyers employ the same variables in deciding what price to pay. I suspect that most buyers do employ the same variables, but the catch is they weight them differently from day to day. These weights are really what we would like to have for a nice  $R^2$ , but it is difficult to put your finger on them.

It would have been impractical to follow through all the animals into the slaughter house, but here again, personally, I would like to see some spot checking of the live grader's performance, even though we assume their errors compensate. How much would the coefficients change when using actual<sup>1</sup> grade and yield?

Also I would like to know if, at this stage of the analysis, and as a result of this study, there are any indications of what sort of recommendations might be made to cattle producers, meat packers, and processors?

In any discussion of pricing accuracy, pricing errors, pricing efficiency, etc., we are holding actual performance up to the light of some standard. I suspect the more general agreement we get on the standard, the less criticism current techniques and future techniques will receive. I suggest that the need is for developing an acceptable and workable standard. If such a standard is drawn up in objective components, its susceptibility to controversy may be reduced.

On the other hand, a study of pricing often is associated with implications or allegations that something is wrong with prevailing prices. Thus we are drawn back into the argument of what should be the price, and we step onto another merry-go-round.

<sup>1</sup> Some people object to the term *actual*, as used here. They contend grade to be subjective, thus an actual grade is indeterminate. Perhaps a less controversial phrase is *carcass grade and yield*.

## CONTRIBUTED PAPERS: OPEN SECTION MEETINGS

### VERTICAL INTEGRATION AND FARM MANAGEMENT

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**V**ERTICAL integration can be broadly defined as the combination under the control of a single firm of two or more links in the chain of production that extends from the primary producer to the final consumer. Control may or may not involve ownership of production resources. Marketing people usually think of integration in terms of merger of ownership. But it need not be so. More significant for farm management is the kind and extent of control exercised over the decision-making and risk-bearing functions of management.

Vertical integration in agriculture is not new. It has always been with us. The self-sufficient farms of colonial times were completely integrated. So were the feudal manors. The whole advance of civilization has been accompanied by a dispersion of functions away from the farm. The term *agribusiness* was recently invented by Professor John W. Davis of Harvard University. As he puts it, "the term agribusiness encompasses today roughly the same scope of functions included under the term agriculture before the intrusion of technology."<sup>1</sup>

Several years ago, D. Howard Doane wrote a book called *Vertical Farm Diversification*<sup>2</sup> in which he set forth the advantages to the farmer of processing and marketing his own products directly to the consumer. In this kind of integration, the farm operator seeks to control the stages of production beyond his farm. More often, however, the vertical integration we have in mind is that in which nonfarm business concerns assume control of some of the management of farms.

#### *Present Status*

How much vertical integration do we have in which the management of farms is integrated in some degree with outside business firms? We do not really know. We do know that various kinds of contracts have long existed in the production of fruits and vegetables for processing. Sugar beets and sugarcane have complex grower-processor arrangements. Seed crops and other specialty crops frequently are produced under contract.

<sup>1</sup> John H. Davis, "Policy Implications of Vertical Integration in United States Agriculture," *Journal of Farm Economics*, May 1957, pp. 300-312. See also John H. Davis and Ray A. Goldberg, *A Concept of Agribusiness*, Harvard Business School, 1957.

<sup>2</sup> D. Howard Doane, *Vertical Farm Diversification*, University of Oklahoma Press, 1950, 183 pp.

Cooperative marketing organizations have grown up with some of these situations and private business concerns with others.

Interest in the last year or two has centered around contract integration in feeding operations with livestock and poultry. The expansion in production of commercial broilers has been accompanied by the evolution of diverse contractual arrangements. In many areas, the feed dealer-supplier has become the real entrepreneur, who makes most of the significant production decisions and bears most of the risk.

Contract production of eggs was recently initiated in Kansas and a few other places under a "package plan" in which the producer is assisted in financing a standard poultry-laying house, and is supplied with layers of specified breeding, formula feed, and other services. The grower agrees to follow recommended practices that result in high-level production of quality eggs.

A similar plan for meat-type hog production, called a "pig-parlor plan" is being tried out in several southern states. Feeder pigs are supplied, the grower is helped to finance a standard hog house, the ration is prescribed, and arrangements are made for market outlets.

Cattle feeding on a fee basis in large specialized feed lots in California and other western states represents another kind of contractual diffusion of the management function.<sup>3</sup> The cattle continue to be owned by the farmer, but the feed-lot manager takes over the feeding job. He performs large-scale feed-mixing operations and is able to adopt labor-saving and other technological innovations that are not feasible on individual farms.

### *What Vertical Integration Does*

What vertical integration does differs with different types of farming. In general, it appears to reduce risk and to increase the scale and efficiency of farm operations. The example of commercial broilers is instructive on both these counts. Broiler production involves price risk and physical risk of sickness and death loss of birds. For the individual grower, these hazards are more serious than for the feed dealer-supplier who may have many growers, whose marketings are spread in time, and whose locations are scattered in space. The risks are averaged out.

New technology probably has been adopted more rapidly in the broiler business because of the dealer-producer relationships. Improved strains and varieties are introduced. The latest nutritional research is used in formulating rations. Assistance in disease control is provided.

The package deals in production of eggs and pigs may improve quality more rapidly than the conventional methods of extension teaching. In all

<sup>3</sup> John A. Hopkin, *Cattle Feeding in California*, Bank of America (bulletin), Feb. 1957.

of the feed-livestock contract plans, increased efficiency also flows from the tendency toward larger operations and better use of labor, housing, and equipment.

The California feedlot operations also provide a more efficient marketing mechanism than exists for individual feeders, in the absence of other organized cattle markets. Buyers visit the large feed lots regularly and this becomes a kind of market where prices are made.

### *Emerging Problems*

Vertical integration solves some farm problems and causes others. To the extent that control of decision-making shifts from the farm to outside business firms, the farm ceases to be an independent firm. This is not necessarily either bad or good. The farm family may still prosper and the rural scene may still furnish the family with the advantages of a favorable social environment.

Even if the farmer ceases to be manager of an independent farm business, he is still a farm laborer or a laborer-landlord with services to sell. Is the market in which he sells these services competitive? Is it one in which he can expect to get full value for his labor and for the use of his real estate?

Probably the shifting of risk from growers to feed dealers made possible by contracting broilers has speeded up expansion. Some observers think this has contributed to overproduction in the industry. For, the independent broiler producer, production is at such a high level that much of the time market prices leave him too small a margin.

Management decisions made by processing firms in their own interests do not always represent the economic optimum for the farmer. For example, a vegetable processor who wishes to extend his canning or freezing season may insist on a contract that requires the grower to plant several crops, even though the grower could make more money by concentrating on one crop.

### *Research and Extension Needs*

Vertical integration is a venture in the technology of entrepreneurship. Research and extension effort of several kinds is needed before we can know what is best to do.

First, local orientation studies are needed to describe the extent and nature of integration practiced in different areas and in different types of farming. Some information can be obtained from former research. But we need new case studies that will describe integration in specific areas.

Individual farm analyses of the effect of alternative forms of integration (or lack of it) are needed too. These would examine scale of enterprise, efficiency, risk and uncertainty, tenure arrangements, rate of adoption of

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improved practices, quality of product, and the like.

Broader aggregative research studies of vertical integration would be helpful also. These studies would include an initial survey of the extent, nature, and importance of vertical integration in agriculture as a whole. The relationship between new technology and integration needs examination. Then there are the questions as to how vertical integration affects inter-regional competition.

Finally, what are the alternatives to integration? Or what are the alternative forms of integration? Production can be coordinated through private contracts between independent business firms as has been done with broilers. Farmers can pool their efforts through a cooperative marketing or purchasing association, or through some other type of joint endeavor.

In some situations, special credit or insurance devices might be developed that would make integration less necessary. In others, perhaps larger scale independent operations by fewer farmers would prove to be a more stable and permanent form of organization.

The whole problem of how the Extension Service can best serve integrated farmers needs to be reviewed. The servicemen provided by feed dealers, canners, processors, and other firms contracting with farmers provide a specialized technical service that is frequently superior to any the county agent is able to give.

This means that some of the Extension Service programs will have to be refocused on the people who provide these primary services. Extension economists will have an unusual opportunity to help farmers and farmer cooperatives in planning adjustments in programs to fit into a more integrated economy.

### *Conclusion*

Vertical integration has been put forward as a possible solution for the farm surplus problem. If all farm production were under contractual agreements with agribusiness firms and no other production were permitted to find a market, then production could be planned in advance and except for fluctuations in weather, no surplus would be produced. This reminds me of the story about the faithful old charwoman who had scrubbed floors on her knees for long hours all her life and who wrote as an epitaph for her own tombstone:

"Don't mourn for me friends, don't weep for me never,  
For I'm going to do nothing forever and ever."

What would happen to those farmers who might be unable to make a deal with an agribusiness firm? Would they do nothing forever and ever? Advance planning for farm production has a contribution to make, but it is not a panacea.



## ECONOMIC EFFECTS OF SHORT-RUN CHANGES IN THE DEMAND FOR LIVESTOCK AND MEATS

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**T**HIS paper will include some preliminary findings on price movements in the livestock and meat economy which are based on quarterly data covering a 38-quarter period from July, 1947, through December, 1956. The findings may be related to several current issues in livestock and meat marketing, including (1) the evaluation of promotional campaigns for the livestock and meat industry, (2) the reduction of seasonal variability in livestock marketings, and (3) the improvement of advance estimates of livestock prices and slaughter.

### *Price-Quantity Interrelationships*

The derivation of the short-run price-quantity relationships involves (1) the use of quarterly economic series, and (2) the use of beef and pork production as exogenous variables. Actual values and first differences of these values are used in the derivation of demand and price coefficients. It is assumed that in each quarterly model all variables except the dependent variable are predetermined. If the assumption is correct, the least square method is conditionally appropriate.<sup>1</sup> In these models, consumers act as quantity adjusters and market prices adjust to the rate of commodity flows through the marketing system.

The quantity of beef or pork consumed is specified as a linear function of (1) beef price, (2) pork price, (3) poultry price, (4) personal income, (5) time, and (6) three dummy variables denoting the third, fourth and first quarters. All price and income variables are deflated by the consumers' price index and both the income and quantity variables are deflated by the population eating out of civilian food supplies. All deflated series are converted into percent of their average 1947-49 values.

Three significant relationships may be noted for both the beef and pork demand equations: (1) the interrelationship between beef and pork consumption and beef and pork prices (Table 1), (2) the effect of income and secular change on pork consumption, and (3) the seasonality in demand, i.e., a third and fourth quarter increase in demand for beef and a fourth and first quarter increase in demand for pork, that is not explained by changes in price and income. The beef equations using index values and first differences explain 96 and 74 percent respectively, of the variation in beef consumption, the two values for the pork equations are 93 and 96 percent, respectively. However, income and time are highly

<sup>1</sup> H. O. Wold, *Demand Analysis*, New York: John Wiley and Sons, 1953, p. 64-71.

TABLE 1. DEMAND ELASTICITY AND PRICE FLEXIBILITY COEFFICIENTS FOR FIVE DEMAND AND PRICE RELATIONS, BEEF AND PORK<sup>a,b</sup>

Market level and form of equation	Beef equations		Pork equations	
	Beef price or quantity	Pork price or quantity	Beef price or quantity	Pork price or quantity
Demand, index values	-.85	.24	.22	-.62
Demand, first differences	-.55	.25	.10	-.59
Wholesale, index values	-1.59	-.24	-.76	-1.71
Retail, index values	.77			.78
Live, index values	.82			1.39

<sup>a</sup> Coefficients are computed at the mean values of price and quantity for a 38-quarter period with respect to consumer demand and a 32-quarter period with respect to market prices—each period ending the fourth quarter, 1956.

<sup>b</sup> All the coefficients are significantly different from zero at the 0.01 probability level, given the mean values of price and quantity, except the elasticity coefficient of consumer demand for pork with respect to beef price, in first differences, and the flexibility coefficient of wholesale price of beef with respect to wholesale pork quantity. Moreover, all the own-price and own-quantity coefficients, except the beef demand coefficient in actual values, are significantly different from unity at the 0.01 probability level.

intercorrelated ( $r = .98$ ) and the test for serial correlation is significant at the 95 percent probability level for the beef equation in index values and the pork equation in first differences.<sup>2,3</sup>

Beef and pork prices at three different market levels in the marketing system are described by single equation models. Wholesale prices are related linearly to (1) wholesale quantity of beef, (2) wholesale quantity of pork, (3) time, and (4) three dummy variables to denote the third, fourth and first quarters. The beef and pork equations explain 94 and 96 percent, respectively, of the variation in wholesale prices. Retail and live prices are described as linear functions of (1) wholesale price, (2) time, and (3) the three dummy variables. These variables explain 97 to 99 percent of the variation in retail and live prices. It is assumed again that the quantities of beef and pork are predetermined; price adjusts to changes in quantity in the short run. But the critical price adjustments occur at the wholesale market level, which is well organized and responsive to changes in price-making factors. Retail as well as live prices adjust to changes in wholesale prices.<sup>4</sup>

The wholesale price equations for beef and pork have two distinctive

<sup>2</sup> Richard J. Foote and Karl A. Fox, *Analytical Tools for Measuring Demand*, USDA, Agricultural Handbook No. 64, 1954.

<sup>3</sup> J. Durbin and G. S. Watson, "Testing for Serial Correlation in Least Squares Regression," *Biometrika*, 37: 409-428, 1950.

<sup>4</sup> The reaction interval could exceed a quarterly period and hence lag variables or some other distributed lag relationship may be needed to evaluate longer-run effects of changes in wholesale quantities.

differences: the reaction of pork prices to changes in beef quantity as well as pork quantity; and the increase in the fourth and first quarter wholesale price of pork and the third quarter price of beef that is not explained by changes in wholesale quantities. The quarterly shifts in wholesale price, however, are consistent with the quarterly shifts in demand.

### *Seasonality and Trend*

The seasonal changes in the demand for beef and pork provide for a relatively high level of beef and pork prices during the peak periods of production. Wholesale beef prices would fall \$4.01, in 1947-49 dollars, during the third quarter while wholesale pork prices would fall \$9.94, in 1947-49 dollars, during the fourth quarter if the seasonal increase in demand did not occur.

Interquarterly shifts are indicated by the movement of the observed residual for the first-difference pork equation. The residuals show a downward movement in the fourth quarter estimates of quantity consumed but an upward movement in the quantity estimates for the third and first quarters. The third quarter movements are related to the concurrent changes in beef and pork production and prices, but other factors affect both the third and first quarter shifts in demand. An analysis of the demand for individual pork cuts may provide additional clues with respect to significant interquarterly shifts in the demand for hams and other pork cuts.

Beef, pork, and poultry price and quantity interrelationships also are affected by the seasonality in demand. Poultry prices usually reach their lowest quarterly levels during the fourth quarter. Thus, poultry competes price-wise with pork and, moreover, poultry prices have declined gradually since 1947. Hence, the downward shift in the fourth quarter demand for pork may be related also to the increase in poultry consumption, particularly during the Thanksgiving and Christmas holidays.

Quarterly changes in pork prices affect beef consumption in both the short run, as indicated by the regression coefficients for the first-difference equation, and in the longer run. The regression coefficient with respect to beef price, however, is not significant in the first-difference pork equation, but the effect of changes in poultry price is significant in only this one equation. Thus, it might be suggested that when pork prices rise, pork eaters shift to beef, but when beef prices rise, a similar shift of beef eaters fails to occur. Poultry eaters, instead, may shift to pork consumption when poultry prices rise, or vice versa. Alleged health and other reasons may result in a smaller total number of potential pork eaters in the population.

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secular changes in tastes to obscure the impact of each on the rate of beef and pork consumption. The method of conditional regression, which was applied on a limited basis, yielded the best fit using beef price, pork price, time, and the seasonal variables when the income elasticity of demand was 0.6 and 1.0 for beef and pork, respectively.<sup>5</sup> The regression coefficient with respect to time was significant only for the pork equation, which showed a 4.0 percent annual decrease in pork consumption.

Finally, quarter-to-quarter changes in beef production have a significant inverse effect on live prices of beef and pork. The inclusion of two additional variables in the primary market price relations denoting the change in beef and pork production over the previous quarter results in price reaction coefficients for the two relations that are unchanged from their previous values. The price flexibility coefficients with respect to change in beef production, however, are  $-.18$  and  $-.20$ , respectively, for the beef and pork equations. Hence, quarter-to-quarter changes in beef production have an additional impact on primary market prices which is not explained by changes in wholesale prices.

#### *Vertical Price Relationships*

The sequence of short-run changes within the livestock and meat economy that would be generated by changes in production or consumption can be illustrated schematically. Attempted inventory levels would be related to previous inventory levels, the change in production over the previous quarter, and the trend in retail prices. Hence, production and attempted inventory levels would determine the wholesale quantities of beef and pork which, in turn, would affect wholesale prices. If wholesale prices are in error and retail prices are set too high or too low to attain the attempted end-of-quarter inventory levels, wholesale prices would be adjusted and retail prices finally would achieve a level to clear the markets of the wholesale quantities. It is assumed that errors in wholesale prices are corrected shortly and hence end-of-quarter inventory levels approach attempted inventory levels for that period.

Retail and primary market prices are both related to wholesale prices. Hence, the impact of changes in wholesale prices on the price spread between the wholesale market and each of the other two markets can be determined. A \$10.00 change, in 1947-49 dollars, in the wholesale price of beef is associated with a \$1.27 and \$0.09 change in the opposite direction, respectively in the live-to-wholesale and wholesale-to-retail price spreads for beef.<sup>6</sup> A \$10.00 change in 1947-49 dollars in the wholesale price of pork is associated inversely with a \$2.94 and a \$1.05 change,

<sup>5</sup> Wold, *op. cit.*, p. 230-234.

<sup>6</sup> Carcass weight basis (59 percent of live weight).

respectively, in the two price spreads for pork.<sup>7</sup> It can be inferred that the price spreads between market levels involve a fixed component and a variable component related inversely to changes in the wholesale price. These results may be related to the price flexibility coefficients in Table 1, which indicate a percentage change in live prices of more than unity and a percentage change in retail prices of less than unity associated with a one percent change in wholesale prices. Finally, it can be inferred that changes in live prices are related to changes in the rate of marketings as well as to changes in wholesale prices.

<sup>7</sup> Seven major pork cuts basis (47.36 percent of live weight).

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## SOME IS-ES AND SOME ISN'TS IN THE FARM PROBLEM\*

HAROLD F. BREIMYER

*Agricultural Marketing Service, USDA*

**T**HIS is an enumeration of positives and negatives in definition and interpretation of the farm problem. It is selective and partial; there can be no pretense of completeness in such brief treatment of so broad a subject.

The farm problem is first of all a problem in retaining the family farm as the elemental unit in agriculture. Most price support laws begin with a clause of dedication to price and income objectives, with "parity" the magic mensuration. Yet the ideal of the family farm rests above those material goals, one stratum of logic removed. The family farm is the vision to which current price support is directed even as much as are federal-state experiment stations, extension services, and land-grant colleges. If agriculture were of huge-scale management units, those educational services and price support legislation alike would be visibly re-oriented. Resolutions eulogizing the family farm as a tenet of policy offered recently by Senators Humphrey and Monroney may be largely gestures but they are not irrelevant.

Whether the family farm as an institution is secure or in jeopardy is a question that is not resolvable by customary statistics. Even a recent highly competent study by the Agricultural Research Service did not entirely come to grips with the problem.<sup>1</sup> That report was chiefly concerned with size of business and with amount of hired labor as indicators of familiness of organization. It was addressed, as is traditional, to large-scale centralized management as the peril. A current threat is of other nature. A farm is of family type only if it meets several criteria. Charles Shuman, President of the American Farm Bureau Federation, specifies a family farm as "one in which the farm family has management control of the operation, depends on the farm for its main source of income, and actually engages in farm work."<sup>2</sup> The first of these—independent management by the farm family—is violated by several recent developments in livestock and poultry, developments hidden within usual statistics of farm size, marketing volume, labor hired, or farm ownership status. Integration in poultry often reduces the poultry producer to a provider of housing facilities and labor. Commercial feeding of cattle when practiced on large scale not only is more a factory than a family farm,

\* Contributed paper presented at open session of the American Farm Economics Assn., Lake Junaluska, N.C., Aug. 31, 1957.

<sup>1</sup> Jackson V. McElveen, *Family Farms in a Changing Economy*, ARS, USDA, Agr. Inf. Bul. No. 171, March 1957.

<sup>2</sup> *The Farm Journal*, June 1957.

but it also converts neighboring "family" farms into satellite suppliers of feed in an economically subservient relationship that deviates from the established family farm concept. The new "pig parlors" and other arrangements in raising hogs also may violate the usual notion of family organization in livestock farming.

It is *not* certain that present price programs, despite their authors' good intentions, are of material preferential benefit to family over non-family farms, whether the latter be overt, large-scale units or covert as in abdication of management control of otherwise family units. Price support, like the rain, falls indiscriminately on family and nonfamily units.<sup>3</sup>

The farm problem is sometimes discussed in terms of failure of farm people to move into nonfarm employment in sufficient numbers. In a sense the charge is correct; in fact, economic disadvantage in any industry or area could be described as overpopulation. It nevertheless is worth pointing out that out-migration from agriculture has *not* been an insignificant trickle. McElveen reported the number of commercial farms as dropping 1.6 million from 1927 to 1954, and 841,000 just since 1944.<sup>4</sup> From 1947 to 1956 the farm population fell 5 million, and since the natural increase over that time was 3½ million, the total migration off farms was 8½ million, or 31 percent of the 1947 population. And this was accomplished despite continued popularity of pseudo-farms (part-time, residential, subsistence). It is surely no inconsiderable relocation.

Commonly these days, the role of technology in agriculture is dealt with elaborately. It would seem that the sorcerer's apprentice has been loosed to haunt agriculture and its sympathizers. The view is reminiscent of the technocracy rage of the depressed thirties. "Technology" threatens to become a catch-word; and we need to remember (1) that technological progress is by no means a latter-day phenomenon but has continued, at varying speeds, decade after decade, in farm prosperity and in farm depression and (2) that much so-called new technology in agriculture can be more accurately described as an introduction of more inputs of non-farm origin. It is expanded use of products from industry. From 1940 to 1955, labor inputs in farming fell 30 percent, yet total principal inputs increased 4 percent as nonfarm inputs rose sharply.<sup>5</sup> Output per unit of

<sup>3</sup> The ARS study (op. cit.) reported little evidence of disproportionate growth of large-scale units. Although the number of those units as measured by volume of marketings has increased, absolutely and relatively, their gains were not out of line with increased productivity of labor. This viewpoint may overstate the significance of hired labor as an indicator of familyness. If a commercial feedlot reduces labor needs to a minimum by near-automation, is it still a "family" operation?

<sup>4</sup> *Op. cit.*, p. 19.

<sup>5</sup> *Changes in Farm Production and Efficiency*, ARS 43-15, ARS, USDA, June 1955; *Possible Methods of Improving the Parity Formula*, Senate Document No. 18, 85th Congress, 1st session, p. 27.

farm labor naturally shows big increases. More valid is a comparison with total inputs, for which gains are more moderate. If we could calculate output per unit of nonfarm inputs, a reduction would doubtless result. (3) Technological progress is surely more a boon than a burden, both to agriculture and to society. (4) Without deciding the old question as to whether invention precedes or follows economic motivation, it is clear that technology is in many respects responsive to economic forces. Technology per se is *not* the cause, nor the cure, of the farm problem.

The farm problem is a problem of maintaining returns to farmers' labor and management, not to other factors of production. As returns to labor are to large extent a residual claim, they are highly sensitive to price levels for farm products. For any given percent change in the parity ratio, imputed net income to farmers' labor and management changes about twice as much. Restrictions on crop acreage at times of surplus are essentially an indirect means to limit the output of labor. Increased availability of inputs of industrial origin have reduced the effectiveness of acreage controls. Furthermore, use of industrial products is highly responsive to price relationships, making efforts to hold prices high by acreage controls alone partly self-defeating.

The farm problem is a problem in instability. For an industry so vast and so decentralized to respond to changes in demand, especially those during and after wars, to compensate for erratic bountifulness of nature, and to adjust to other dynamic influences while striving for adequate and reasonably stable incomes is a large assignment indeed. Inelasticity of demand makes the problem worse—and demand may be becoming even more inelastic than before.

The farm problem is a problem in differential rates of growth between the farm and nonfarm economy. Much as we applaud the improvement in consumer diets, much as we stress the further opportunities remaining, the fact is that in an expanding economy agriculture is one of the less expanding parts. Agriculture is highly sensitive to gains in consumer income when an economy emerges from depression into prosperity, but is much less so during slow economic growth. These comments are especially relevant to the experience of the last few years.

Even though food as consumed retains a high position in consumers' expenditures, the farm contribution to it is becoming ever smaller. This transforms the farmer into less and less a producer of a consumer good that need only be marketed and distributed and more and more a producer of raw materials for manufacture. This is one meaning of the descent of the farmer's share of the consumer's food dollar to 40 cents last year, least since depression. It is the meaning also of protests that services account for increasingly more of the "food" as sold at retail

and of its price. Casting farm products into a position relatively more remote from their final use revises the nature of the price-making mechanism. It is a part of the farm problem and has significance to farm policy. It is no coincidence that "basic" price support crops are commodities that return low percentages of the consumer's dollar to farmers—as low as 14 percent in 1956—and that marketing agreement commodities except milk also yield low percentages. All this has a lesson for price analysts, who have proclaimed the close linkage of farm product prices to consumer preferences and behavior, a linkage that is no longer so close as formerly.

The setting and machinery of pricing is a part of the farm problem in yet another respect. That part of agriculture that retains "free" market pricing is coming to be more exceptional than ever before. It is a small island in a sea of price making by bargain, administered rigidity, or force of law. This commentator cannot judge what all the implications may be. Investigations on the theory of oligopolistic pricing and on the behavior of flexible and inflexible prices would appear in order.

And the farm problem is partly one of ends. Economists may or may not feel called upon to eschew concern with value judgments; farmers themselves are free to revise their value judgments, and do so. Farmers have in the main joined the demand for more stability, more security, more regularity and predictability in their economic affairs. Manifestly, this is in conflict with the inherent variability in farm output, and also with certain other ends such as independence of action that have long been treasured. This conflict will be an integral part of the farm problem for some time to come.

## SOME IMPLICATIONS OF AN EXPORT SUBSIDY

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SUBSIDIES from the U. S. Treasury have been used to stimulate exports of agricultural commodities. Such an action may increase the demand in specific markets. This paper is concerned with two questions of an export subsidy: (1) Can the subsidy be used as a total revenue maximizing device? (2) How are the total subsidy expenditure and the total income increase related?

The type of subsidy involved in this discussion is one paid on a per unit basis on all of the product sold in the foreign market. Administrative procedures and the geographical nature of the market preclude seepage among markets. Exporting firms operate in a climate of competition. The product is homogeneous. The supply of the product is fixed—quite inelastic.

### *Can the Subsidy Be Used as a Total Revenue Maximizing Device?*

Total revenue for one product arising from two distinct markets may be maximized by equating the marginal revenues. One necessity is that there be no possibility for seepage among markets. Another necessity is monopolistic control over the quantity going to each market. We have said that exporters are operating in a climate of competition, but can the subsidy be used to maximize total revenue?

Figure 1 shows demand in the domestic market,  $D_d$ , plotted on the left. Foreign demand,  $D_f$ , is plotted on the right. The total supply is  $OQ$  and is, obviously, quite inelastic. The two demand curves give rise to the marginal revenue curves,  $MR_d$  and  $MR_f$ . With competitive firms a "world" price of  $OP$  will exist with a division between the two markets as indicated. To maximize revenue, however, we must equate  $MR_d$  with  $MR_f$ .

The diagram shows that this may be done with only above point  $X'$  and still market the entire quantity,  $OQ$ . If  $OX'$  goes to the domestic market, it will sell for  $OP'$ . If  $X'Q$  goes to the foreign market, it will sell for  $QP'$ . This distribution between the markets may be achieved under competition only if  $D_f$  would intersect  $D_d$  directly above  $X'$ . To get this intersection, we may add a subsidy in the foreign market equal to the vertical distance between  $D_d$  and  $D_f$  directly above  $X'$ , or  $AB$ . Adding  $AB$  to  $D_f$  gives rise to  $D_f'$ . Now the total revenue is maximized under the maximizing criterion existing before the subsidy is paid.

\* The writer is indebted to William G. O'Regan, formerly Associate Professor of Agricultural Economics and Consultant to the Statistical Laboratory, University of Florida, for the mathematical proofs in this paper.



A new situation develops now, however. When the foreign demand shifts upward, a new marginal revenue curve arises. This means that *total* revenue, including revenue from the subsidy as well as the market price, is not maximized under this solution. The new solution is found at that point where the marginal revenues are equal at a point directly

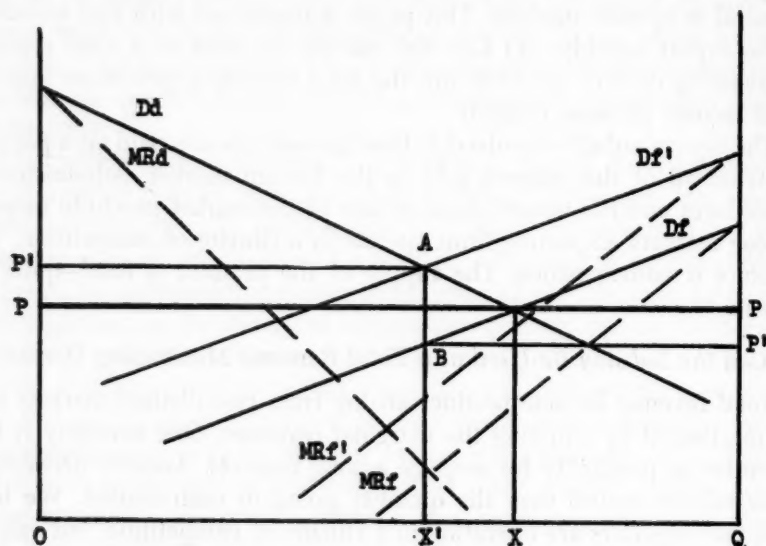


FIGURE 1

below the intersection of the demand curves. This point is found where the demand curves have the same elasticity coefficient at their point of intersection. Let  $P_1$  represent the price in the domestic market and  $P_2'$  represent the total price in the foreign market, with the subsidy. Under competition these must be equal. They can be written:

$$P_1 = a_1 + b_1 q_1$$

$$P_2' = a_2 + b_2 q_2 + s$$

where  $s$  is the amount of the subsidy per unit. If we solve for  $s$  we get:

$$s = a_1 - a_2$$

Therefore, the subsidy which will maximize total income is equal to the difference between the intercepts. This may be shown mathematically or graphically.<sup>1</sup> The marginal revenue lines have slopes exactly twice

<sup>1</sup> This may be shown as follows: We know that

- (a)  $p_1 = p_2'$
- (b)  $MR_1 = MR_2$
- (c)  $q_1 + q_2 = Q$

as steep as the demand lines and since they start from the same distance above the X axis, both pairs of lines intersect at the same point relative to the X axis.

### *How Are the Total Subsidy and the Total Income Increase Related?*

The total subsidy payment by the government is equal to the per unit subsidy times the share of the product going to the foreign market. The

where  $p_1$  is the price in the domestic market,  $p_2'$  is the final price in the foreign market,  $MR_1$  and  $MR_2$  are the marginal revenues in the domestic and foreign markets, respectively,  $q_1$  and  $q_2$  are the quantities going to the domestic and foreign markets, respectively and  $Q$  is the total quantity. Since marginal revenue is the first derivative of the total revenue equation (b) may be written:

$$\frac{dTR_1}{dq_1} = \frac{dTR_2'}{dq_2}$$

We also know that

$$\begin{aligned} p_1 &= a_1 + b_1 q_1 \\ p_2 &= a_2 + b_2 q_2 \\ p_2' &= a_2 + b_2 q_2 + s, \end{aligned}$$

where  $s$  is the subsidy added to the foreign demand. With these equations the first set, (a) and (b) may be rewritten:

$$\begin{aligned} a_2 + b_2 q_2 + s &= a_1 + b_1 q_1 \\ a_2 + 2b_2 q_2 + s &= a_1 + 2b_1 q_1. \end{aligned}$$

Solving for  $q_2$ , these may be rewritten:

$$\begin{aligned} -(b_1 + b_2)q_1 + s &= a_1 - a_2 - b_2 Q, \\ -2(b_1 + b_2)q_1 + s &= a_1 - a_2 - 2b_2 Q. \end{aligned}$$

Solving for  $q_1$  we get

$$\begin{aligned} q_1 &= \frac{(a_1 - a_2 - b_2 Q) - (a_1 - a_2 - 2b_2 Q)}{(b_1 + b_2)}, \\ q_1 &= \frac{b_2 Q}{b_1 + b_2}. \end{aligned}$$

If we had solved for  $q_2$  we would have obtained  $q_2$  as

$$q_2 = \frac{b_1 Q}{b_1 + b_2}.$$

Solving for  $s$  we get

$$\begin{aligned} s &= 2(a_1 - a_2 - b_2 Q) - (a_1 - a_2 - 2b_2 Q), \\ s &= a_1 - a_2. \end{aligned}$$

total income increase is made up of the total quantity times the price increases. If we maximize with respect to market income only, then the total subsidy paid by the government may be equal, larger than, or smaller than the total increase in income. In general, if the slope of the foreign demand is greater than the slope of the domestic demand, given equal market shares, the total subsidy will be larger than the income increase. If the foreign demand is more elastic than the domestic, then the subsidy is smaller than the income increase. Given demand curves with equal slopes in each market, the total subsidy is smaller than the income increase if the share of the product going to the foreign market is smaller than that going to the domestic market.<sup>2</sup>

The size of the income increase and the total subsidy are equal under all demand conditions when the maximization is reached with respect to the total of market income and subsidy income. This may be shown by reference to the components of the income increase and the total subsidy payment. The income increase is equal to the price increase times the total quantity marketed.

The total income increase may be written<sup>3</sup>

$$(a_1 - a_2) \left( \frac{b_1}{b_1 + b_2} \right) Q,$$

where  $a_1 - a_2$  is the amount of the subsidy,  $b_1$  is the slope of the domestic demand,  $b_2$  is the slope of the foreign demand and  $Q$  is the total supply.

<sup>2</sup> For a similar analysis of the effect of a subsidy to consumers upon the income of producers, see "Economic Analysis of the Food Stamp Plan," Special Report to the Secretary of Agriculture, October, 1940, by N. L. Gold, A. C. Hoffman, and F. V. Waugh.

<sup>3</sup> The price increase is equal to

$$(a_1 - a_2) \left( \frac{b_1}{b_1 + b_2} \right).$$

This may be shown as follows:

$$\text{From } p_1 = a_1 + b_1 q_1,$$

$$p_2 = a_2 + b_2 q_2,$$

$$Q = q_1 + q_2.$$

We can write four equations, as follows:

$$Op_1 + p_2 + Oq_1 - b_2 q_2 = a_2,$$

$$p_1 + Op_2 - b_1 q_1 + Oq_2 = a_1,$$

$$Op_1 + Op_2 + q_1 + q_2 = Q,$$

$$p_1 - p_2 + Oq_1 + Oq_2 = 0.$$

The total subsidy is equal to the subsidy per unit times the quantity going to the foreign market and may be written

$$(a_1 - a_2) \left( \frac{b_1 Q}{b_1 + b_2} \right),$$

where the symbols have the same meaning. The expression of the income increase and the total subsidy are equal. Therefore, under all conditions, when total revenue is maximized with respect to market and subsidy incomes, the total subsidy payments are equal to the income increase.

### *What Are the Major Limitations of This Approach?*

*Linear Demand.* The type of demand curves used in this analysis are almost surely unrealistic. In general, some sort of nonconstant relationship prevails. Even if the general nature of the demand curves were known, the inexact nature of the knowledge would preclude the precise determinations described here.

*Demand Shifts.* The solutions of the analysis are valid only with demand curves which do not shift. Demand does shift over time, but in market periods, the effect of the shifting may not be important. The possibility is greater for sudden shifts in foreign demand than in domestic demand.

*Supply Considerations.* The analysis is valid only if costs are accounted for in the derived demand curves. The supply in the period is quite inelastic. These assumptions are fairly realistic for many agricultural products, in my opinion.

*Seepage between Markets.* There is a possibility that the subsidy may be paid on shipments that are not made. It would seem administratively feasible to prevent this.

Solving for  $p_2$  we get

$$p_2 = \frac{b_1 a_2 + a_1 b_2 + b_1 b_2 Q}{b_1 + b_2}.$$

Since  $p_2' = a_2 + b_2 q_2 + s$  and may be written

$$p_2' = a_2 + b_2 \left( \frac{b_1 Q}{b_1 + b_2} \right) + s, \text{ then}$$

$$p_2' - p_2 = \text{the price increase} = a_2 + b_2 \left( \frac{b_1 Q}{b_1 + b_2} \right) + s - \frac{b_1 a_2 + a_1 b_2 + b_1 b_2 Q}{b_1 + b_2}$$

$$p_2' - p_2 = (a_1 - a_2) \left( \frac{b_1}{b_1 + b_2} \right).$$

*Extent of Competition.* Differentiated products may affect the simplicity of the solutions. The demand in the foreign market may be for a higher quality. Or it may be for the same quality delivered in the foreign market, meaning higher quality leaving the shipping point. The extra costs connected with higher quality may be handled in the derived demand.

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## IMPLEMENTATION OF RURAL DEVELOPMENT

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THE rural development program has emerged as a new attack upon the problem of low income with several states initiating work in pilot areas. In North Carolina, a state committee, composed of representatives of 22 agencies and organizations was formed in late 1955 to provide guidance to activities in three selected "pilot" counties.

In relating experiences examples will be cited from Watauga County, located in the mountainous northwestern corner of North Carolina. Although burley tobacco, vegetables and livestock constitute the principal sources of cash farm income in the country, the predominance of subsistence farming is illustrated by the fact that three fourths of the farm operators sold less than \$1,200 worth of farm products in 1954. The Blue Ridge Parkway and a local historical drama promote a summer tourist trade. Prior to the initiation of the rural development program, an electronics plant employing approximately 160 workers was the major manufacturing industry in the county.

In developing a county plan of procedure, more than 75 local persons, representing various business interests, geographical areas, and public agencies, have been involved in committee study. The committee reports adopted specified particular problem areas, goals, and general means of attaining the goals. In organizing and implementing a program in this and other pilot areas, certain unanswered questions have arisen relative to the nature of economic development.

A major problem is the expectation of a "program" to produce quick results versus the long-term nature of economic development. Rural people have long been besieged with drives, campaigns, and programs. Therefore, it is natural that the questions should be asked: What are the distinguishing features of rural development? And, what unique accomplishments will be afforded by this particular program?

Several circumstances prevent comprehensive results at the outset of a program in economic development. Time is required for program development and coordination of activities of the diverse agencies and groups. It is necessary to involve local people in organizing a program that will arouse action and provide direction. To minimize loss of interest, priorities on projects may be established to include some activities that will produce immediate results related to a long-run objective. For example, the Watauga County extension staff erected a bulletin rack in the local electronics plant for the employees, most of whom are women living on farms. Some 964 publications were distributed in the first month, i.e. around 5 publications per employee.

A second element that impedes substantial immediate accomplishments is related to the nature of disadvantaged areas. Most attempts to classify causes of low incomes embrace (1) the resource problem—either inadequate or underdeveloped, (2) the preference or motivation problem, and (3) the resource adjustment problem.<sup>1</sup> To some observers, these various casual factors justify a number of approaches and activities. However, it may be contended that regardless of the cause(s) involved, equivalent effort could produce greater results in less disadvantaged areas.

Examples of economic factors in disadvantaged areas with long-range consequence include (1) the difficulty of obtaining the initial industries that will attract trade and other auxiliary industries, (2) slow response in adjusting farming systems or in learning new types of work on the part of aged persons, who constitute a relatively high proportion of the population of disadvantaged areas, (3) development of resources in disadvantaged areas. Education of human resources obviously is time-consuming. The supply or quality of other production factors may be limited. (Rural development has been publicized as something other than a "government-aid" program, yet insofar as limited or underdeveloped resources are causing the low incomes, transfers of income may be necessary to reduce differentials in levels of living.) (4) Lack of enthusiasm of established entrepreneurs for added competition in the factor market. A low tenancy rate and limited industrialization in Watauga have minimized this problem with respect to labor. However, the premium on level land for farming and residences and the tourist appeal of the area have resulted in exceptionally high prices asked for suitable industrial sites.

Despite the magnitude of these problems, specific and positive action must be and is being undertaken.

Activities relating to agriculture in Watauga County include the following: (1) Development of an agreement for marketing commercial eggs through the Northwest North Carolina Development Council, (2) Measures to improve efficiency in dairying in this area where relatively low market prices have prevailed; e.g. initiation of the weigh-a-day-a-month plan and special meetings concerning artificial breeding and production of manufacturing milk, (3) a series of meetings on production of home food supply, (4) special demonstrations to arouse interest in new sources of farm income, such as strawberries, (5) expansion of farm planning activities with individual families by extension agents, (6) a comprehensive market survey conducted by extension marketing spe-

<sup>1</sup> See Don Paarlberg, "Facing the Problem," pp. 31-32, and C. E. Bishop, "Clarifying the Problem," pp. 6-14 in *Rural Families with Low Income*, Proceedings of the American Country Life Association, 1956.

cialists at N.C. State College and local extension agents, and (7) a research study to develop plans for improved farming systems underway by the Department of Agricultural Economics.

Work relating to industrial growth includes the following: (1) organization of "Watauga Industries Incorporated" to purchase land and erect buildings for new industries with local funds, (2) obtaining a garment manufacturing industry which began operation on July 15 with 30 employees with expansion to 100 expected by the end of 1957. Assistance provided by rural development committees and public agencies in obtaining this industry included providing information on county resources while company officials were investigating possible sites and assisting company officials in survey of prospective women workers. Following publicity by radio, newspaper, 7,000 leaflets distributed through community stores and by school children, and personal visits, 568 women appeared at the county court house on a rainy foggy day for interviews. Additional applications for work in the garment plant are being received by the employment service. A building 100 by 120 feet for leasing to garment manufacturer by Watauga industries was constructed with expansion anticipated. Facilities were arranged for training initial employees.

These projects illustrate the possibility of specific action even though economic development implies a long-range problem. However, the pilot countries have not been overwhelmed by the volume of suggestions from the state or national levels as to concrete projects or methodology. Descriptive information on the nature of the problem has not implied automatic solutions.

A second perplexing attribute of the program lies in the difficulty of appraising achievements and methodology even though its experimental nature places a priority on evaluation. Obviously, the investment of public funds and subsequent publicity on the rural development program have directed attention to the accomplishments of the pilot areas. There are the traditional difficulties in evaluation of educational and developmental efforts. For example, would the garment manufacturer have investigated Watauga County as a location for a new plant in the absence of the program? Activities stimulating agricultural efficiency and local industrialization will raise income levels in the pilot areas. To whatever extent rural development accelerates out-migration, the effect on income of the migrants will be difficult to measure.

A third major question might be raised. Should the primary efforts be focused in areas of low income or directed toward families with low income? Obviously, all families living in the delineated disadvantaged areas do not have low incomes. A broad developmental approach would

emphasize education and recognize economic factors and institutional arrangements external to the firm or even the pilot area. On the other hand, measures directed specifically at families having low incomes afford opportunities for reducing differentials in levels of living through personalized counseling. These unanswered questions justify a number of approaches and bold experimentation in the program.

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## PRICE STABILITY AND PRICE MAXIMIZATION IN FLUID MILK MARKETS

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*Marketing Research Division, AMS*

CLASSIFIED price plans in city milk markets have been the subject of sharp controversy. They have been attacked as monopoly devices to raise prices of milk to consumers, as a factor in the creation of surpluses of manufactured milk products and as one cause of low returns of producers who supply milk for making these products. They are as staunchly defended as an essential device for the protection of producers, for the promotion of orderly marketing of milk and as a means of assuring adequate supplies of safe milk for consumers.

The Marketing Research Division of USDA's Agricultural Marketing Service recently undertook a study to try to improve our understanding of the economic theory applicable to the operation of classified price plans. My remarks today are in part based on this study.

There is an element of uncertainty in existing economic literature as to whether the controversial aspects of classified pricing are inherent in the plans themselves or are actually related to their applications. The distinction has a bearing on how people in and out of the industry look on these plans. Are they *prima facie* devices either for exploiting consumers or for protecting their milk supply? Is the adoption of a classified price plan in a market, which is not under a government milk marketing order, a proper basis for an anti-trust prosecution or should the main attention be directed to the effects of its operation in the particular circumstances of the market?

We can get this matter in a clearer perspective if we isolate two kinds of pricing objectives, which a milk producers' association (or a government agency) might seek to achieve through its pricing policy: One, we will call the stabilization objective; the other, we will call the price maximization objective. By price, we mean the producer's price or the return he receives when his milk is sold to handlers under a classified price plan. In practice, both the stabilization and maximization objectives influence pricing policy in varying degrees but we can get a better understanding of classified pricing if we first deal with each of them separately and then discuss factors leading to an emphasis of one objective or the other.

The stability objective has been an outgrowth of historical conditions. In city markets where producers were not organized, the perishability of milk caused its price to be hypersensitive to seasonal or other excesses of supply over demand. Because neither demand nor supply is very respon-



sive, over a short period, to moderate price changes, even a very low price to producers would not always bring the two into balance. Thus some producers might be forced off the market temporarily.

The organizing of producers and the application of classified pricing was an attempt to solve this problem. Under this system of pricing, the producers' association sells milk to dealers at one price for the fluid milk market and at one or more lower prices for disposition in manufacturing markets.

Thus the seasonal surplus, or any abnormal excess of supply, no longer acts as a depressing factor on the price of milk sold for fluid use and it enables all producers to remain as year-round participants in the fluid market. In this application of classified pricing, blend return to producers from sales for fluid and surplus uses is maintained at a level consistent with the demand and supply expectations in the market.

Once producers are organized and have adopted the class-price system of selling milk, there is nothing to stop them from trying to get more out of this application of price discrimination. In fact the incentive to do so is very great because the demand for milk for fluid use seems to be inelastic and the leaders of cooperatives are, in most city markets, rather conscious of certain protective devices on the supply side.

Applying classified pricing to enhance producer returns in city milk markets is analogous to discriminative pricing in international trade. The city market is the sheltered "home" market where the producers' association has a measure of control over prices. The manufactured milk products' markets are the "foreign" markets where prices are lower and are not significantly affected by milk diverted or "dumped" from the fluid market.

Demand responses to change in milk prices are however more elastic over a long period than for a short period. But short-period elasticity is likely to have more influence on the leaders of a producers' cooperative when they are considering what level of Class I price will be most advantageous to its members. Thus immediate profits may be acquired for milk producers at the expense of an ultimate loss of fluid sales which is greater than expected.

Over a period of time, the supply responses in the market caused by higher returns to producers also tend to reduce the advantages of applying classified pricing for the purpose of raising producers' returns. As the proportion of surplus rises, the blend return to producers declines. Thus although classified pricing can effectively enhance producer returns in the short run, attempts to do so are not likely to be profitable to producers over an extended period of time. The benefits of whatever improvements in blend returns may remain after a prolonged period

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tend to be dissipated by higher costs of production, including those costs associated with higher land values. The ultimate situation is that the high price of Class I milk remains but the monopoly profits of operation are gone.<sup>1</sup>

The long-period consequences of classified pricing within a city market, when applied for the purpose of maximizing producer returns, are (1) a decrease in the consumption of fluid milk; (2) an increase in the total supply of milk on the market; and (3) an intensification of efforts to slow down the rate of increase of supplies.

Classified pricing, when applied in many large city markets at the same time with the object of enhancing producer returns, also affects the markets for manufactured milk products. The additional quantities of milk diverted from fluid markets add to the supplies of milk available for the manufacture of butter, milk powder, evaporated milk and other products with depressing effects upon the prices of these products and upon the returns of those other producers whose primary business it is to supply milk for manufacture.

Two main conclusions emerge regarding the long-period consequences of the application of classified pricing with the objective of maximizing returns of milk producers supplying fluid markets. One conclusion is that it is not very effective for such a purpose. The other conclusion is that high Class I prices causes serious disadvantages to city consumers and to producers who sell milk to manufacturing plants.

How then do we account for a policy of high Class I pricing as it appears in many city milk markets? We have already mentioned a tendency for association officials to take what might be called a short-range view of pricing policy. This is perhaps typical of most sellers who have some discretion in setting their own prices. Longer-run effects of prices upon both demand and supply are underestimated or disregarded.

Institutional factors also exert an influence toward high Class I pricing policies. The sheltering aspects of local health regulations (slowing the flow of supplies from new sources) is an enticement to a high Class I price policy. Once this policy is applied it may be bolstered by the creation of quota plans to hold back the output of producers already on the market. Producers' associations themselves are organized to get the best return for their members. Their officers are subjected to pressures from members to raise Class I prices to accomplish this. During periods when farm prices are falling due to broader economic causes, this pressure to protect producer income by exploiting at least to some degree the more sheltered fluid milk market can be almost irresistible.

<sup>1</sup> Some producers may benefit from an increase in the capitalized value of their farms but new producers coming on the market would not share in this benefit.

Dealer control over prices of fluid milk at the consumer level creates a presumption of monopoly profits in which producers seek to share through raising the Class I price. This policy is encouraged in some instances by a rough balance of bargaining power between the larger handlers and the producers' organizations. In such situations, mutual advantage at times appears to lead to high Class I prices and to low prices of milk for surplus uses.

For more than two decades, government milk marketing programs have played an important part in price determination in city milk markets. The influence of these programs upon price policies is not easily ascertained. Empirical observations regarding surpluses in some city markets under government regulation create a presumption that these regulations do not necessarily alter to a great degree the kind of pricing policy that would result in the absence of such regulations. This is, however, a complicated area in which we need to know a good deal more. The interactions of the forces of private and governmental institutions, under conditions of government regulation, comprise a useful and provocative field for further research.

## MARKETING ADJUSTMENT AND EXTENSION EDUCATION

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**D**URING the past year we have devoted considerable time and effort at Iowa State College to adjustment problems in production and marketing. This adjustment problem has implications for extension workers in marketing.

We are all familiar with the forces that have operated to induce adjustment. On the one hand consumer disposable incomes have been increasing since the 1930's. This rise in personal income has resulted in an increased demand for services such as freezing, packaging, precooking and restaurant meals. Also there has been an increase in the quality level demanded.

Changes in production also have affected marketing firms and processors. Improved transportation, the trend toward increased farm size and increased commercial production have had an impact on marketing. As output of individual products has increased at the farm level, the possible gains from producer marketing activity have increased. Determining the quality and the timing of marketing has become important enough to individual farmers for them to devote more managerial effort in this direction.

For our purposes today marketing adjustment will be defined as those changes a marketing firm must make over time if it is to maintain or improve its competitive position with other firms processing or handling similar products or competing products. Adjustment is a continuous process in all sections of our economy. The rate of adjustment will vary over time in different industries and among segments of an industry. Adjustment becomes a problem in any area when the rate of adjustment does not keep pace with the rate of change in the forces that make adjustment necessary. In this paper we will concern ourselves only with the effects of these changes upon the individual processor buying raw material directly from the farmer and the impact of these changes upon the extension workers serving these marketing firms.

### *Effect of These Forces on the Marketing Industry*

The impact of the changes at the consumer and producer level has resulted in some drastic changes in our marketing system. These changes first showed up in the retailing area. A large portion of the retail food firms (independent operators as well as corporate, voluntary and cooperative chains) no longer buy through wholesale houses. Direct buying from processors on a price-specification basis has replaced many wholesale

houses. The order book has replaced the salesman in many wholesale firms, as grocers affiliate with specific suppliers. The result of these changes is a decreasing number of retail outlets from 387,000 stores in 1939 to 279,000 stores in 1954.<sup>1</sup> At the same time volume per store and per worker has been increasing.

Changes at the retail level have brought changes at the wholesaling and processing level. The shift by retailers from buying as individual firms to buying as one member of a larger business unit has made increased branding and differentiation feasible. This shift has involved all processors, large or small in the "Battle of the Brands." Integration has been increasing. Examples are poultry and dairy processing, and now some processors are talking about integrated livestock operations.

#### *Effect on Individual Processors*

Many individual processors can see the result of the adjustments on the farm. In the past few years they have been under pressure to enlarge their facilities to increase their volume and thereby reduce costs per unit of output. This has been necessary because improved roads and the increased level of technology on the farm have reduced the producer's dependence upon a single outlet. Since 1946 the number of creameries in Iowa has dropped from 437 to 335. During the same period average output per plant increased 11 percent.

A few years ago the plant volume problem, for example, would be relatively simple to solve. The big question would be selection of the appropriate volume. Once this had been set, management decisions would only involve changes within the plant. The output combination and sales outlets would be unchanged.

Today the increased interdependence between marketing stages has considerably reduced the area in which the processor can make such independent decisions. A change in volume may dictate a change in sales outlets. A processor must consider various alternatives such as direct selling to retail organizations under their private brand, developing his own brand and performing the wholesaling function himself or selling through wholesale firms. The same interdependence exists in procurement. The development of new products and improved merchandising of old products places each firm under pressure to pay higher prices to producers in order to maintain or increase volume. The volume decision takes on a new dimension when this is considered. It is not just a question of how much total output—but a question of how many products and how much of each.

Such interdependence complicates the decision making in processing.

<sup>1</sup> *Agr. Outlook Charts*, USDA, AMS ARS, Sept., 1956.



This, however, is only the beginning. Changes in merchandising methods have forced an entirely new area of decision making upon many processors in recent years. Decisions concerning use of resources in advertising, promotion, packaging, market testing, quality control programs and others now confront many firms. Heretofore, these firms had to concern themselves only with processing problems. In order to make more rational decisions processors are being forced to look upon the entire process of moving products from the farm to the consumer as a single integrated process.

### *Effect Upon Marketing Extension Education*

If extension education is to keep pace with the marketing industry, it will have to adjust at a faster rate than the industry. Much of our marketing extension work at present is oriented along commodity lines. One individual, through study and experience, becomes proficient in one or two commodities. He develops a particular area and has little communication with other extension specialists, research personnel in economic, and technical specialists in other departments.

In some cases the specialist has been primarily concerned with farmer marketing decisions to the exclusion of industry problems. This is not enough. If we are to provide education and leadership that will facilitate adjustment in marketing, we must work with all segments of the industry.

The specialist type of organization has been effective in the past and, in many cases resulted in efficient resource use. However, this method may not continue to be effective as marketing problems become more complex. The problems that confront processing firms also confront the extension worker. We must know more than our clients if we are to provide education and information that they can use in their decision making processes. If processors are unable to get the education and information they need from the extension service, they will either do without, purchase it from commercial consulting firms, or get it from service departments of firms serving the industry.

Doing without results in a cost to everyone—producer, processor and society. Advice and consultation purchased from commercial consulting firms or individuals may be excellent. However, many small processors would not receive competent counsel for several reasons: the cost involved, lack of awareness of the nature of their problems, and inadequate knowledge for wise selection of consultants. Field services from commercial firms can serve a very useful function in increasing the rate of adjustment in marketing firms. However, they are not and should not be expected to be an unbiased source of information. Irrespective of the number and kind of information sources available to operators the exten-

sion service has a responsibility to provide leadership in making available education and information that will facilitate marketing adjustment.

### *Possible Methods of Approach*

Some marketing extension workers realize that many marketing problems require more than economics for solution. Some of them, in one fashion or another, have begun to call upon other disciplines for help. This is a start toward what might be called the commodity-marketing-team approach.

The complexity of present-day marketing problems requires the knowledge of a variety of disciplines. The noneconomic considerations must taken into account in order to make rational decisions. The economist is the logical focal point in synthesizing the information from the different disciplines; for the results of decisions in noneconomic areas manifest themselves in economic consequences for the firm. Food technologists, industrial marketing personnel, production technologists, psychologists and sociologists as well as economists are involved in many areas of marketing. By combining the talents of specialists in several areas the economist has a much better basis of determining the economic and social consequences of alternative courses of action. A schematic illustration of the commodity team is shown in Chart 1.

Another method of approaching this education problem in marketing might be called the functional approach. It is also a team approach, but instead of assigning responsibility on a commodity basis, a problem area method of assignment is used. With this a price specialist would work on price problems and a transportation specialist would be responsible for all transportation problems regardless of the commodity involved. The number and kind of specialists needed in different states would vary and would have to be determined on an individual basis. Some states would perhaps need several men in each functional area while other states could have one man responsible for several problem areas. For example, a state with a small staff may have one man responsible for procurement and

#### Noneconomic specialists

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Production specialists  
Food technologists  
Engineers  
Industrial marketers  
Psychologists

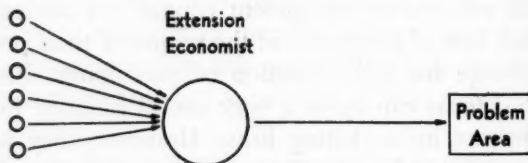


CHART 1. COMMODITY TEAM

transportation and another man responsible for pricing and merchandising.

The functional method carries the team idea one step further than does the commodity method. The commodity group consists of an economist and people in other disciplines who bring their knowledge to bear upon a particular marketing problem. The functional group consists of a team of economists working in different problem areas. These economists in turn form another unit with specialists in other disciplines for the noneconomic information that is needed in their area. The economists then fit the various segments of the total problem together to determine alternative courses of action. A schematic illustration of the flow of information from the specialists to the problem is shown in Chart 2. There are advantages and disadvantages to both methods. Each, however, is designed to focus the knowledge from various disciplines on a particular problem.

The two methods mentioned above are not the only methods that might

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specialists

Sociologists  
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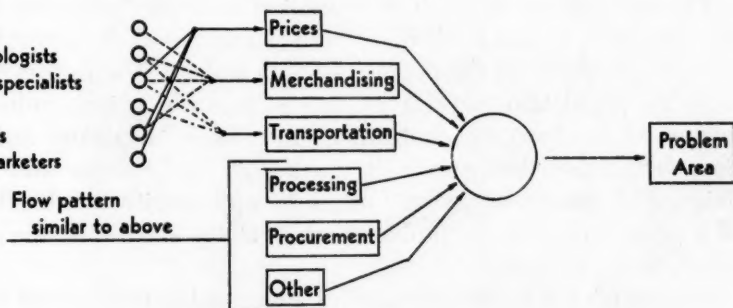


CHART 2. FUNCTIONAL TEAM

be used to allocate resources in extension marketing education. Variations and combinations of the two methods and other methods may very well be superior to those outlined. However, the first step in adjusting extension marketing education is the realization that the marketing process is a single continuous process involving many skills and disciplines rather than a series of independent processes. This is necessary if we are to provide information that will form a basis for rational marketing decisions. We have come to this realization in many problems in marketing research. Extension, however, has lagged behind in this respect. The rate of adjustment in extension education will have to be greater than the rate of adjustment within marketing firms if we are to continue to provide education and leadership.

## TOOLING UP FOR TOMORROW'S JOB

LYLE M. BENDER

*South Dakota State College*

I PROPOSE to discuss type-of-farming information and how it is used in a general extension educational program in South Dakota. "Tomorrow's job" might be defined as the adjustments in agriculture to general economic growth. "Tooling up" suggests a change in the educational approach. If we wish to lead we must stress the development of people to the end that they, through their own initiative, may effectively identify and solve the various problems directly affecting their welfare.

### *Area Analysis—13 Factors of Change*

In developing a comprehensive report on "The Rural Economy of South Dakota" I chose the historical and farm-unit approaches and applied these to the state and its seven economic areas.

The first part of my study was devoted to an analysis of 13 factors of change. These factors of change served as a means of discussing the major problems confronting the people of South Dakota. The factors of change included population, natural production hazards, prices, industrial development, land use, mechanization, size of farm, technology and production, farm labor, tenure, credit, marketing, and income and levels of living. This means of analysis offers an opportunity for detailed study of a particular group of problems while at the same time the interrelationships can be noted.

All through the historical analysis I attempted to indicate the important trends associated with the major factors of change and the reasons for the trends. To add more meaning I have pushed the analysis forward into the future by projecting trends and suggesting alternative courses of action. Such an approach should serve to guide and to encourage our people to follow through on a course of action.

Throughout this study I related the state to the region and the nation on important factors of change. The area comparisons were made relative to the state. Such a scheme of analysis I believe, contributes to a broader understanding of basic problems.

To illustrate what I have done I would like to review with you two summary statements taken from a recent outlook letter that was the last of a series of four on production-consumption adjustments. The general summary is pitched to the question, what will South Dakota agriculture be like in 1975?

*Population, Number of Farms and Technology*

South Dakota's population has grown at a slower rate than in the nation as a whole. Rural population in the state and in the nation continues to decline. The number of farms in the state continues to decline as in the nation but at a slower rate. This is a natural result of the increased use of agricultural technology in a growing national economy with expanding job opportunities that become attractive to excess farm labor.

Just as today, almost all of South Dakota's commercial farms in the next few years will be family farms. There continues to be a need for both small and large farms. A broad educational program, a steady growing national economy, local industrial development, and improved labor placement will aid these adjustments.

*Production, Land Use and Technology*

The relative increase in agricultural output in South Dakota has been about equal to the national average but continues to be more unstable. An increased output of agricultural products, for the nation, in the neighborhood of a third over 1950 is projected as being adequate to meet market demands by 1975. South Dakota agriculture will continue to contribute its share in the years ahead.

The shifts in land use in South Dakota in the next few years will be toward less food grains and oil crops, little change in feed grains, and more emphasis on grasses and legumes for hay and pasture.

Some further increases in livestock production, in the state, can be expected. The composition of the breeding units will change a little. Beef production is likely to hold its dominant position and expand somewhat. Milk cow numbers and sheep numbers are likely to change only a little. Swine and poultry production, especially egg production, will tend to increase over the years and will vary closely with feed grain production. These are natural results of the shift to grasses and legumes and their complementary effects on yields per acre of feed grains.

New technologies will continue to be developed that will have a direct bearing on both crop and livestock production. Most commercial farmers will adapt these new techniques which lower their per unit costs, increase outputs, and increase net incomes. Of the new technologies, increased production per acre and increased efficiency in the use of feed are likely to be important factors contributing to the rising output needed in the years ahead. For the early part of the period ahead more attention needs to be given to those technologies that tend to reduce costs without greatly increasing total output.

For the most part I have used the state summary in general feature



articles that have been used by the main daily newspapers in the state, and in general talks before farm and nonfarm groups. In localized talks I have introduced area trends for some of the factors.

By using the historical analysis of the factors of change—the macro aspects of our general economy—our people are supplied with information that will both be helpful in problem solving and in assisting them in thinking through the various alternatives to final solutions. Furthermore, as teachers it enables us to better understand the broad problems that confront them.

### *Area Analysis—Farm Units*

While we can contribute much to help improve the welfare of our people by helping them to get a better understanding of the general economic trends, more is required. From the foregoing analysis, "change" is most certain. The nature of the problems of our farmers deepens.

Some of our farm families must decide where they can get the most returns from their labor, skills and capital—in farming or in other employment. Many of our farm families, now on farms too small for family farms, will be under pressure to secure a larger volume of production and income. The majority of our farmers will be faced with such problems as adjusting resources to different uses, adjusting production to effective demand, reducing income instability, reducing costs and building up eroded and depleted land.

Here is where farm planning at various intensities can help. The use of actual farms where the various alternatives are budgeted enables us to get an understanding of realistic farm problems and it provides a means of helping the farm family to understand and to solve its own farm problems. Furthermore, it provides a means of teaching fundamental farm management principles that are basic to problem solving. The use of modal-type farms can be successful in a wide variety of meetings and as feature stories for newspapers.

To illustrate our procedure I will use a particular modal-type cash-grain and livestock farm in our North James River economic area. This is one of our major wheat areas so most of the farmers are confronted with the wheat-livestock adjustment problem.

As a means of tying the individual farm into the area of which it is a part, using census data I usually set forth in tabular and narrative form the main characteristics of the common types of farms. I have used types of farms as my main classification because most farmers usually refer to their operations in this way.

The use of an actual farm in teaching problem solving personalizes the approach and makes it more acceptable when used in general educa-

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tional meetings or as feature news stories. A rather complete description of the farm is essential. Through a personal interview with a cooperating farmer I secured information on his present organization and management factors, problems, goals of the family and his ideas of the alternatives open to him. During the course of the interview I secured much input-output data and other information that gives some indication of the managerial capacity of the farmer.

The next step takes us into the analysis of the problems confronting the farmer. Here I describe the problem, point out the important facts, discuss the basic principles needed to solve the problems and work out some alternatives. This may be done on a partial or whole-farm basis but for our general purpose we use the whole-farm approach.

On this particular farm, a 960-acre, cash-grain and livestock farm, the main problems include: income instability, production adjustment, soil depletion, and resource use.

For this farm I prepared two plans. These and the farm as presently operated were budgeted using a series of projected prices.

The present crop organization included a variety of crops of which wheat and corn were most important. The main livestock enterprises were beef and dairy (Shorthorns) supplemented with hogs, sheep and poultry. The farm was operated under average management conditions for the area. The farm was adequately equipped and the buildings were adequate except the hog barn. The net income as budgeted was \$7,471 and the investment was estimated to be \$60,193.

In Plan 2 the crop enterprises were reduced by cutting out barley and flax. The wheat acreage was cut 25 percent and this land was shifted to sweet clover-fallow. The livestock organization was changed by cutting out sheep, adding a cattle feeding enterprise and increasing the poultry and hog enterprises. The breeding cattle enterprise consisting of Shorthorns was reduced in size from 34 to 23 head with 10 of the better cows to be milked. Moderate improvements were made in cropping and livestock practices, and a new 10 sow hog barn was provided for. Under this plan the net income budgeted was \$7,731 and the investment was estimated at \$60,824.

Plan 3 was developed to determine the effects on income from the use of commercial fertilizer. The organization was the same as for Plan 2 except for the addition of fertilizer spreading equipment. The budgeted income was estimated to be \$9,802 and the investment was \$60,911. In periods of dry weather the response to commercial fertilizer would not be as great as indicated and probably would not be used. However in favorable periods the use of fertilizer provides an opportunity to expand income thereby adding flexibility to his operations.

By using the partial or whole-unit planning approach our people are supplied with information that will both be helpful in problem solving and in assisting them in thinking through the various alternatives to final solutions. Educational programs can be successfully carried out as independent programs in public affairs, marketing and farm management. However, it seems to me, there is much merit in combining public affairs problems and farm or market problems where ever possible. We have been fairly successful on several projects such as the soil bank, meat-type hog marketing, and the shift from cream to whole milk.

### *Educational Program*

If we are to be effective in bringing about adjustments within agriculture and between agriculture and the rest of the economy, it is important that urban and rural people be as well informed as possible relative to the farm situation and the need for these adjustments. To me, this suggests the use of mass media—newspapers, radio and TV. Not to be excluded are general meetings of rural and urban groups and leaders of various kinds of organized groups.

Two illustrations will suffice to expose our efforts.

### *Production-Consumption Projects*

This project is aimed at the masses of people as well as specific groups. It is based on the Barton-Daly and related reports with local adaptations from "The Rural Economy."

A series of 31 slides was prepared to show the past and present situation in agriculture, and the potential demand and production of farm products. A mimeographed circular entitled "Changes in Farm Output and Demand for Farm Products" was prepared for use with the slides. It contains the same charts as are in the slide series plus discussion notes for each slide and a summary of the adjustments for South Dakota. This circular was designed to serve two purposes, namely, information for the agent or leader, and handout material following meetings. Both the circular and the slides were pretested with county agents and farm groups.

The mimeographed circular was sent to county agents. The slides are available to them on a loan or purchase basis. In addition the mimeographed circular was sent to representatives of all county farm organizations. Suggestions as to the several use possibilities were outlined for both county agents and county leaders.

To secure wider coverage this material was condensed into four feature articles for our Farm and Ranch Outlook Letter. Working with our editorial and radio specialists our coverage was extended state wide by the use of four feature news stories and four radio broadcasts.

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*Sound Management—Good Farming Program*

I am using this example to show the necessity of flexibility and the willingness to gamble as we plan educational programs.

Early last year we proposed an area adjustment project for our county agents in the North Central and North James River Economic Areas. This was to be a one-day meeting in each county with the forenoon devoted to general and area problems and the afternoon to dryland adjustments and irrigation possibilities. In both these areas we have the wheat and irrigation problem. This particular scheme didn't appeal to the county agents at the time, but this is what happened.

The leading daily newspaper in Central South Dakota, serving much of this area publishes an annual farm edition. Through the local county agent's influence, the editor of this paper decided to feature farm management. We at the College were asked to submit stories on the subject. Gambling on a hunch and ignoring the advice of my co-worker I prepared two rather lengthy articles. One was on the general economic problems of production-consumption with local adaptations. The other was an analysis of a local farm in the area emphasizing the shift from wheat to livestock. Both stories took the number 1 and 2 spots on the front page under the following headlines "Broad Planning Guide to Maintaining and Bettering Living Levels" and "Alternate Farm Plans are Charted for Spink Grain-Livestock Farm." In the same paper we also got a good play on irrigation. Was our mission accomplished? Through a little different approach we presented the same general information we had outlined to our county agents. Three county agents came through with the integrated type project for irrigation where we in extension Economics cooperated with the Bureau of Reclamation.

I believe people have a genuine interest in and can grasp general economic problems. The use of a state and area analysis enables one to analyze the pertinent factors of change in such a way that those concerned will be able to make a better adjustment to the future than would otherwise be probable. Such information can be successfully presented to the general public through mass media channels.

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## TOWARD MORE EFFECTIVE TRAINING IN THE ECONOMIC FUNDAMENTALS

E. D. CHASTAIN, JR.\*

Alabama Polytechnic Institute

THE greater ease with which rigorous analyses can be made of problems or topics limited in scope is generally recognized. Farm management workers have been conscious through the years that such a pathway of least resistance can create a situation of inability to see the forest for the trees. In an effort to view the forest, this paper treats, in a general way, a basic problem which has a drastic influence in the activities of all economists—in teaching, research, extension, and industry. Reference is made to the difficulties in and experiences associated with the training of college students in the fundamentals of the economic discipline. Lest your expectations be misleading, the approach pursued is one of attacking the *fundamental, basic* issues involved and not one of considering various techniques which may or may not have value in the college classroom or an explanation of the “known” in student motivational problems.

Economics is a discipline dealing with the everyday problems of all the people, and the meaningfulness of the activities of all professional economists is related directly and significantly to the effectiveness of training in the economic fundamentals at the beginning college level. In discussing this topic, no attempt is made to pose as an authority, but the viewpoint expressed is by one who, after having followed the extension and research pathways, finds challenge and stimulation in the college students who are seeking economic knowledge *per se* for the first time on a formal basis.

Ours is a science of choice. Let us proceed by examining five fundamental contrasts in basic economic teaching. Any value from this procedure doubtless lies in the orientation, emphasis, and repetitive elements rather than in one of originality. Most of the contrasts are believed to have meaning on all college campuses, agricultural or nonagricultural—economics or agricultural economics departments.

*Economics may be learned through a stamping-in process (memorizing, drill) or through understanding.*<sup>1</sup> A case can undoubtedly be built for the stamping-in aspects of learning, but the strength of our teaching in

\* The favorable environment provided by the administration of A.P.I. for the teaching of agricultural economics has been a major factor prompting the preparation of this statement; however, these comments are based on more extensive observations since all of my formal training and most of my experience and associations have been at other institutions.

<sup>1</sup> George Katona, *Psychological Analysis of Economic Behavior*, New York: McGraw-Hill, 1951, p. 43.

economics lies primarily with our ability to create an environment and motivate students to acquire economic knowledge through the "understanding" form of learning.<sup>2</sup> The student seeking to acquire a grasp of the elasticity concept by memorizing often becomes confused; whereas, the student grasping the concept through understanding experiences less difficulty and shows progress in his work. Another example can be cited of the student who visualizes and understands geometrically the equilibrium position of the firm in pure competition versus the student who commits to memory for examination purposes the various lines that are involved and the relative position of each line. Are these examples in economics any different from the high school student who memorizes and experiences difficulty in plane geometry versus the student who seeks understanding of the proofs by a "thinking-through" process?

Why do students have a tendency to memorize in economics? Could it be that they are merely following in the footpaths of the economists with whom they are familiar, including their instructor? Economists have a reputation for the "collection and dissemination of figures," and economists are noted, for example, for their ability to "spout" figures in handling outlook and other economic subject matter. Attaching a broad meaning to the word "economics," countless questions are asked of American economics students which require the regurgitation of census-type figures which the student forgets as soon as he leaves the course, if not before. Certainly, these type approaches do not teach students to think. They do not create a desire for the student to acquire knowledge through understanding rather than the commitment to memory of so-called facts which, without an adequate framework for use, are meaningless.

An unbelievable amount of the criticism advanceable can be traced to the "easy-to-grade" type examinations. The inconsistencies between the "easy-to-grade" and the "teaching-the-student-to-think" objectives evidence a need for reexamination of our testing procedures.

*The learning of economic subject matter is accompanied by the development of attitudes relative to the discipline.* The problem of attitudes in basic economics is as familiar to economists as the problem in basic chemistry is to the chemists. Complementary ranges doubtless exist relative to the attitudinal and the subject-matter products. Neither the dry, dismal, rigorous lecture<sup>3</sup> nor the hour of joke-telling is the answer. Optimum allocation can be expressed, using our conventional marginal approach. Perhaps it is more meaningful to say that the best that can be expected from a content or subject-matter standpoint is the development of a framework in which knowledge can be assembled and utilized rela-

<sup>2</sup> See Ben W. Lewis, "Economic Understanding: Why and What," *American Economic Review*, May, 1957, pp. 653-670 for elaboration on this issue.

<sup>3</sup> Lewis' comments on this point are interesting, *Ibid.* pp. 661-662.

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tive to the solving of problems during later time periods. The framework has value only if the attitudes developed are of such a nature that the student will make use of it during later life. Likewise, the learnings can be no greater than the subject offerings, directly and indirectly.

In seeking a solution to the attitudinal problem, let us turn to the recognized successful extension educators. Professor Bottum and others have profited by restriction of class size, the use of the discussion instead of the lecture method of instruction, and the attacking of every-day or current problems in seeking more effective economic education with extension audiences.<sup>4</sup> Seemingly, the teacher of what Professor Bottum refers to as a "captive"<sup>5</sup> audience can profit by the experience of the successful extension economists with regard to these as well as possibly other factors contributing to greater success.

*The opportunity exists for instilling or destroying the confidence of the student relative to economics.* If the nonchemistry major loses confidence in his grasp of chemistry but passes the course, he may not encounter any ill effects. Yet, assuming the economics course has some "meat," the effects of destroying the confidence of the individual can be detrimental throughout life since all people are economists of some sort. Keynes even states that "Practical men who believe themselves to be quite exempt from any intellectual influences are usually the slaves of some defunct economist."<sup>6</sup>

The ideal teaching relationship between student and teacher is one of two learners. Such association carries a connotation of understanding between the two individuals. Patience and understanding of the individual student and his problems and the ability to encourage the individual student to have confidence within himself so that he seeks additional economic knowledge in the years ahead, appear to be fundamental attributes of the successful teacher of economics, and attributes which all economics teachers should seek.

*The assignment of the economic educator is to explain and not to complicate the obvious.* Once subject-matter is within the grasp of the individual, it then may take a form within his mind that may cause him to label the concept, principle, or whatever the subject-matter may be

<sup>4</sup> J. Carroll Bottum, "Developing a Set of Basic Principles for Economic Extension," *Journal of Farm Economics*, December 1954, pp. 894-900; J. Carroll Bottum, "Increasing Farmers' Understanding of Public Problems and Policies," *Ibid.*, December 1955, pp. 1307-1315; John O. Dunbar, "Old Age and Survivors Insurance," *Increasing Understanding of Public Problems and Policies*. Farm Foundation, Chicago, 1953, pp. 100-111.

<sup>5</sup> The implications of Professor Bottum's reference to the college class as being a "captive" audience are objectionable, but they are apparently highly truthful, in general, in terms of past treatment. *Journal of Farm Economics*, Dec. 1954, p. 898.

<sup>6</sup> J. M. Keynes, *The General Theory of Employment, Interest and Money*, New York: Harcourt, Brace and Company, 1935, p. 383.

as common sense. No "known" information should be difficult for the student if he is qualified to undertake the study and has competent instruction. It is only in the area of the "unknown" that difficulty is inherent.

Much of the work of attorneys exists on the basis of man's inability to communicate with 100 per cent accuracy. Attorneys use a precise language which requires translation for most laymen. In recent years, some farm economists and home economists have taken upon themselves the translator role for farm people in matters of agricultural law. Yet, some economic writings or speakers are more difficult to understand than it is to read law or to listen to the family attorney.

As economic teachings become subject-matter for all people, the opportunities, responsibilities and services of the professional economists undoubtedly increase rapidly. Logical reasoning justifying deliberate confusion of the obvious does not exist. Some unintentional confusion is characteristic in all disciplines; deliberate confusion can advisably be left to the attorneys.

*No one can logically specify in detail what another should teach or how it should be taught.* As earlier stated, this writing has intentionally dealt in generalities. The opportunity for profiting by individual difference in teaching economics makes ours an interesting and challenging discipline. Academic freedom in our classrooms today is unsurpassed relative to the other activities in which economists are engaged.

The extent of our contribution is highly dependent upon the placement to meaningful use of our individual differences as we who operate in "free" teaching environments have the privilege of doing.

### *The Ultimate Objective*

Two years ago, Earl L. Butz, in addressing our association, emphasized the need for economic education of our people.<sup>7</sup> The extent to which the aggregate are educated by extension or any other organization is related directly to the effectiveness of the training in the economic fundamentals in our colleges. *The assignment of a secondary role to our resident teaching programs relative to research and extension is disturbing.* These scholars of today are the leaders and teachers of tomorrow.

The solution to the problem of more effective training in the economic fundamentals at the college level is a difficult but a fascinating and stimulating one. Little will be gained by waiting for the sunrise to increase the rate of progress.

<sup>7</sup> Earl L. Butz, "Policy Formulation and Economic Literacy," *Journal of Farm Economics*, December 1955, pp. 1266-1277.

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## SURPLUS EXPORT POLICY AND DOMESTIC FARM POLICY

JOE A. MARTIN  
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**I**N THE last three years we have seen a gradual recovery of United States agricultural exports from the post Korean War drop. The current volume of exports is at about the same level as prevailed in the boom years of the late 20's and in the post World War II period. When the historical trend is calculated at constant prices, the 1956 level of farm exports was at a postwar peak and was surpassed in the last thirty years only slightly by 1927.

In respect to the recent upturn in agricultural exports, it seems fair to say that there is little likelihood that we will be able to maintain this increased volume of exports over any extended period of time. This judgment is supported by the fact that 41 percent of our farm exports last year went out under foreign loans, grants to foreign governments, special barter deals for strategic materials, and sales for foreign currency. While our total agricultural exports have increased almost 20 percent since 1954, bonafide sales in the open market abroad declined by about 6 percent.<sup>1</sup> To put it another way, our agricultural export market is expanding at a slightly lower rate than the rate of increase in Congressional appropriations to pay for exports.

Aside from the long-standing reciprocal trade agreements program, our current agricultural trade policy finds expression primarily in the Agricultural Trade and Development Act of 1954. This act authorizes sales for foreign currencies, barter transactions, grants for emergency foreign relief, and donations to private charities for the needy overseas. Sales for foreign currencies have accounted for a major part of the exports under this program.

The one remaining new look in our export policy is found in a competitive pricing and export subsidy plan which has been in operation about a year. This is an attempt to hurdle the price gap between the domestic and export markets on price supported products. This gap ranges from as low as 9 percent for some seed crops to around 40 percent of the price for nonfat dry milk solids. To close or narrow this gap the Commodity Credit Corporation sells surplus stocks to exporters at competitive prices or export subsidies are paid to them. Last year C.C.C. released for sale to exporters nearly one billion dollars' worth of surplus products (mostly wheat and cotton) at world prices. This amounted to 28 percent of our total agricultural exports in 1956. The proponents of this plan can

<sup>1</sup> U.S.D.A. Foreign Agricultural Service, *Increasing U. S. Farm Exports*, Nov. 1956, p. 70, table 10.



take comfort in the fact that surplus stocks of wheat and cotton are being reduced.

This program has its precedent in world trade and in our own history, but it ought to be recognized for what it is. To sell in the foreign market at prices below the domestic price is dumping. In our proclaimed role as promoter of world peace and champion of economic progress for all peoples of the world, are we not defeating our purposes by attempting to unload our domestic economic problems on others? Are we willing to jeopardize an opportunity for leadership in the direction we would like to see the world go for such a temporary solution to our surplus problem? It seems to me that agricultural leaders throughout the country should ponder this question seriously before pressuring Congress to continue on this path. The stakes are high in the game of international dumping, and one may wonder if we have carefully considered all the risks involved.

Aside from such repercussions as we are already experiencing and may expect from other countries as a result of this two-price plan, it should be clear that the problem of finding and holding foreign agricultural markets is deeper rooted than the price "gap" alone. The more fundamental problem is the dollar "gap": a situation growing out of our failure to import sufficient quantities of foreign products to pay for all the things we would like to export. As a result there are limited dollars available in our export market, and the American farmer finds that the most effective competition in that market comes from our own industrial economy. It is not the efficiency of agriculture in other countries so much as it is the uniqueness and efficiency of American industry in the world that squeezes our farm export market. As dollars become scarce to foreign importers, they are able to turn to other areas of the world for farm products, regardless of the price. This is not so true for industrial products. Therefore, the limited dollars are used to buy our industrial products while the market for our farm products dries up.

We, as economists, have constantly emphasized the inconsistency between price supports for agriculture and our foreign trade policy. We should not overlook the fact that this is not the only glaring exception in the direction of United States foreign commercial policy toward freer trade. In spite of the fact that we have, since Cordell Hull's time, assumed the leadership in a world crusade to lower the barriers to international trade, we have too often refrained from practicing what we preach. Professor Jacob Viner, who is perhaps our best informed scholar on the trade question, recently stated that "the duties on our tariff which have survived the trade agreements negotiations probably account for almost all the restrictive effects on imports of the tariff as it was before 1934."<sup>2</sup>

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The argument can well be made that the misbehavior of other people does not justify agriculture's conduct in this matter. Let us ignore for a moment then the shortcomings of others and analyze the reasons for our own lack of faith in freer trade. When we start probing at this point some difficult questions present themselves: Is the conflict between our domestic agricultural policies and freer trade one that can be reconciled and at the same time satisfy the objectives on both sides of the issue? If not, which objective is more important? These are questions that are begging a good answer before any change in policy is likely to be made. As of yet we economists have not come forward with a politically acceptable prescription to reconcile the conflict. As for the question of which objective is more important, it is my own opinion that few economists are capable of offering much good advice here. It is here that the statesman must come to the rescue.

The United States foreign commercial policy is not an exceptional case in the modern world. All the advanced nations have armed themselves with legal and institutional barricades to protect their internal economies from real and imaginary competition from outside. This universal practice is not difficult to understand. All responsible governments and political parties in the world today place first emphasis upon meeting the demands of its people for an expanding domestic economy which will provide full employment and ever-rising incomes. Out of this has come national planning to achieve these goals. The internal variables of investment, employment, supply and demand are all calculable and can be influenced in accordance with national or pressure group interests. The international markets, on the other hand, are independent variables beyond the direct control of national planning and no government so far is willing to assume the risk, however small it may be, of sacrificing domestic stability for the chance of economic gain through close integration with economies beyond its borders.

When all countries are following the same course, those outside variables beyond their control can only be expected to increase and in turn push all countries further into their shell of isolation.

For the large countries with strong economies, such as the United States, where only a fraction of our national income is involved in the process of foreign trade, it is difficult to find any good reason for our trade policy other than timidity. No responsible person or party would suggest that we sacrifice the welfare of any large or small segment of our citizens in the interest of more trade. It is not necessary that we

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<sup>2</sup> "The Role of the U. S. in the World Economy," paper prepared for the Conference on National Policy for Economic Welfare at Home and Abroad, Columbia University, 1954.

do so. Certainly with a 400 billion dollar national income and the resilience that our economy has exhibited in recent years, we should have enough imagination in our planning to take care of the minor shocks that would come from fluctuations in foreign markets.

It is, of course, absurd to argue for free trade in the traditional sense that it implies and requires the old laissez-faire type of domestic policy. That system was good so long as it was the other fellow to whom the rule applied. But all the other fellows, both at home and abroad, have learned to recognize their economic interests and know how to protect them. What is required is a kind of thinking and planning which has no tradition, an imagination which appreciates and understands the fact that, a thriving foreign trade, if it is to exist, must fit within a framework of the objectives of domestic policies of countries engaged in trade. Rather than continuing the universal game of all loser-no winner by every country attempting to transfer their burdens of relative economic inefficiencies and maladjustments to some foreign country, let us recognize the interest of those with whom we would trade and in like manner lead them to respect our interests.

In this connection, it seems to me that we can learn a good lesson from the recent action of the Japanese government to voluntarily limit the export of textiles into the United States market over the next five years. Regardless of the merits of the complaints made by the American textile industry against the imports of textiles from Japan, the Japanese knew by past experience that legal barriers would probably be raised to protect American interests unless they took some action to counteract such a move. The Japanese also knew from past experience that once such a legal barrier was raised, the possibilities for removing it in the future would be remote. Rather than take a negative course, Japan is now saying to us: We recognize and respect the rights of the American workers now employed in your textile industry, but we believe such adjustments can easily be made in your domestic economy over the next five years which will permit both countries to benefit through increased trade without economic injury to any group within the United States. It will be interesting to see how we respond to this challenge from our friends in the Orient.

To shift trade policy in this direction will demand allegiance in trade relations which reaches across national boundaries. The planning horizon must be extended in some way to encompass the whole trade area. This does not imply that national political sovereignty must be sacrificed. It does mean though, that in our trade relations with other countries we must have respect for the economic rights of all workers, whether in a Swiss watch factory or a Detroit automobile plant; and the same consid-

eration for the economic rights of producers, whether a Georgia cotton farmer or his counterpart in Brazil or Pakistan. Just as the economic rights of our fellow citizens are derived, not from our sufferance, but from social justice; so it is with all people with whom we seek economic integration through trade for mutual gain.

To counter the argument that this suggested approach for reducing the barriers to trade is idealistic, there is the fact that it is realistic. Such a program can be argued on sound logic, and on positive terms of mutual economic interest, rather than on a Utopian dream of transferring the sovereign power of national states to a world government.

If we are convinced that there are some real benefits to be realized from freer trade and are willing to provide leadership in that direction, then we must start from where we are in domestic policy. To me, it seems that what we need to do as a nation more than anything else is to frankly admit to ourselves that the objectives of some of our domestic programs for the support of specific groups are indispensable and to start from there in developing a foreign trade policy. After four years of the present national administration and an election campaign in which both major parties supported the same domestic program, there should be little doubt left where we as a nation stand on domestic policies. As a democracy we have made the valuations and decisions that have brought us to this position in domestic policy. It is not realistic to assume as a basis for our foreign trade policy that our present domestic policy is a passing fancy, or a temporary experiment, and that we will soon return to the good old days, which most of us frankly admit never existed.

# GRADUATE STUDENTS CONTRIBUTED PAPERS

## THE EFFECT OF AGRICULTURAL PRICE SUPPORTS ON THE BALANCE OF PAYMENTS IN THE UNITED KINGDOM<sup>1</sup>

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### *Introduction*

IF ALL price supports to products and factors (including such indirect supports as embargoes on foreign products) had been removed from British agriculture and if farmers had continued to use the same resources in the same way, then the return received by British farmers in 1953-54 would have been lower by some £300 million—almost their whole net income in that year.<sup>2</sup> One of the main claims used to justify this high level of subsidy payment has been that British agriculture “saves foreign currency (including dollars).” Although unsubsidized agriculture in any country could be found to assist in maintaining or restoring the balance of payments equilibrium of that country, it does not necessarily follow that subsidizing agriculture will always improve the balance of payments position. The analysis that follows suggests that the net deficit in the U.K. balance of payments in 1953-54 was actually increased by the use of price supports to home-produced agricultural products. These product subsidies amounted to some £250 million in 1953-54, while subsidies to assist specific farm practices accounted for the remaining £50 million.

This analysis is first concerned with assessing the gross saving in foreign currency per pound of product subsidy within agriculture; then with the reduction in this gross figure due to a subsidy allocation among commodities that was other than optimum for the goal of currency saving. The final refinement concerns the interindustry allocation of subsidies.

### *Gross Saving in Foreign Currency per Pound Subsidy Within Agriculture*

From the traditional assumption of an initial equilibrium under static perfect competition, the saving in foreign currency due to a product subsidy to the home producer can be deduced by examining the effect on this equilibrium.

<sup>1</sup> This article is based on an M.S. Thesis entitled “Some Effects of Government Support to Agriculture and the Motor Industry in the United Kingdom,” which was submitted to the University of Nottingham in October, 1956. Criticism of the original work by Mr. Knud Rasmussen is gratefully acknowledged.

<sup>2</sup> Nash, E. F., “The Competitive Position of British Agriculture,” *Journ. of Agric. Econ.*, Vol. XI, No. 3, pp. 222-234, June, 1955. In the discussion (p. 235) Mr. Colin Clark claimed to have reached the same conclusions if “we define output . . . as excluding fodder but not deducting any other inputs.”



In Fig. 1, the initial equilibrium condition is represented by the total supply curve  $S_{H+F}$  (composed of supply  $S_H$  due to the home producer and  $S_F$  due to all foreign producers) and the curve  $D$  representing the total demand in the home market. At this position,  $m$  units of the given commodity are exchanged at "world" price  $\pounds p$ . The home producer supplies  $hm$  units where  $h$  is the proportion supplied by the home producer. The foreign producers together thus supply  $(1-h)m$  units and the total payment in foreign currency is equivalent to  $\pounds p(1-h)m$ .

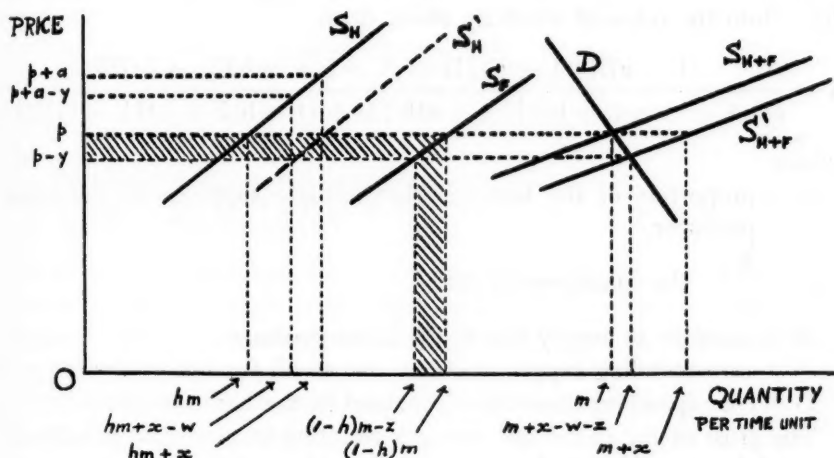


FIG. 1. SAVING IN FOREIGN CURRENCY PER POUND SUBSIDY UNDER PERFECT COMPETITION. (Corresponds to hatchured area.)

If the home producer now receives a subsidy of  $\pounds a$  per unit, he will be induced, in the first instance, to supply  $(hm+x)$  units at a price of  $\pounds(p+a)$ . (Curve  $S_H$  is assumed to be positive sloping. The vertical distance between any point of curve  $S'_H$  and the corresponding point on  $S_H$  is equal to the value of the subsidy.) With the same supply due to all foreign producers, the total supply would then be increased to  $(m+x)$  units at "world" price  $\pounds p$ . (Each point on curve  $S'_{H+F}$  is derived by horizontal addition of the corresponding points on  $S'_H$  and  $S_F$ .) Assuming the same demand for the commodity, this increased quantity would only clear the market if the "world" price were reduced. But such a price reduction would cause a reduction in the supply due to all foreign producers and some reduction in the supply due to the home producer. Equilibrium would be reestablished when the home producer supplies  $(hm+x-w)$  units at the subsidized price of  $\pounds(p+a-y)$ . With the same demand at this new equilibrium position, a total of  $(m+x-w-z)$  units will now be exchanged at a market price of  $\pounds(p-y)$ . The corresponding supply due to all foreign producers will

have been reduced from  $(1-h)m$  to  $(1-h)m - z$  in response to a fall in "world" price from  $\mathcal{L}p$  to  $\mathcal{L}(p-y)$ .

The saving in foreign currency per  $\mathcal{L}$  subsidy ( $\lambda$ ) resulting from a total product subsidy payment of  $\mathcal{L}a(hm+x-w)$  at the new equilibrium position would be as follows (in  $\mathcal{L}$ 's sterling):

$$\lambda = \frac{y(1-h)m + (p-y)z}{a(hm+x-w)}.$$

Further analysis is facilitated by transposing the above expression for  $\lambda$  into the relevant elasticity terms thus:

$$\lambda = \frac{(1-h)H[(1+F)\{D+(1-h)F+hH\} - hrHF]}{\{D+(1-h)F+hH\}[(1+rH)\{D+(1-h)F+hH\} - hrH^2]}$$

where

$h$  = proportion of the home market initially supplied by the home producer,

$r = \frac{a}{p}$  = the subsidy-price ratio,

$H$  = elasticity of supply due to the home producer,

$F$  = corresponding supply elasticity due to all foreign producers,

$D$  = corresponding elasticity of demand in the home market.<sup>3</sup>

The gross saving in foreign currency resulting from a price subsidy on any product would then be higher, if the values of the other four variables were held constant, in each of the following cases: (a) the smaller the proportion of the commodity originally home produced ( $h$ ), (b) the smaller the subsidy-price ratio ( $r$ ), (c) the larger the elasticity of supply

\* Given  $H = \frac{x-w}{hm} \bigg/ \frac{a-y}{p}$ ,  $F = \frac{z}{(1-h)m} \bigg/ \frac{y}{p}$ ,  $D = \frac{x-z-w}{m} \bigg/ \frac{y}{p}$  by definition,

$$\text{then } x = \frac{ahmH}{p}$$

$$y = \frac{pz}{(1-h)mF} = \frac{ahH}{D+(1-h)F+hH}$$

$$z = \frac{ahmH(1-h)F}{p[D+(1-h)F+hH]}$$

$$w = \frac{zhH}{(1-h)F} = \frac{h^2H^2am}{p[D+(1-h)F+hH]}$$

The new form of  $\lambda$  is then derived by substitution. Slopes rather than elasticities at the appropriate points on the supply and demand curves can be used to express the sufficient condition for currency "saving." Elasticity has been used above pragmatically. Elasticity of demand is defined throughout this paper in a positive sense for the same reason.

due to the home producer (H), (d) the smaller the supply elasticity due to all foreign producers (F), and (e) the larger the elasticity of demand in the home market (D).

The nature of the values generated by the above function is further illustrated in Table 1.<sup>4</sup>

TABLE 1. GROSS SAVINGS<sup>4</sup> IN FOREIGN CURRENCY (IN £'s) PER £ PRICE SUBSIDY ACCORDING TO PROPORTION ORIGINALLY HOME PRODUCED (h) AND THE SUBSIDY-PRICE RATIO (r)\*

r \ h				
	0.2	0.4	0.6	0.8
0.2	0.87	0.72	0.53	0.30
0.4	0.75	0.62	0.45	0.26
0.6	0.65	0.53	0.39	0.22

\* Assuming

(a) elasticity of supply due to the home producer = 1

(b) elasticity of supply due to all foreign producers = 2

(c) elasticity of home demand = 0.5

It is generally assumed that the incorporation of risk and uncertainty in the model of perfect competition results in a reduction in incomes primarily because resources are dispersed to more than an optimum degree for income maximization. If it be assumed that the provision of subsidies reduces the over-all subjective risk and uncertainty of farmers, then the model more nearly approximates the real situation. If, however, uncertainty is thought to be increased by product subsidies, since farmers would fear their sudden removal or modification, then the importance of H in the above expression of  $\lambda$  is probably overweighted. The following analysis assumes that any effects of subsidies on the subjective risk and uncertainty of production of individual commodities cancel out.

If all foodstuffs can now be considered as one commodity by converting to a common calorie unit, then the proportion of home produced "food" prior to World War II was about 30 percent.<sup>5</sup> If one also assumes the removal of embargoes and monopolies, the weighted average subsidy-

<sup>4</sup> The stability of the savings in foreign currency given in Table 1 with respect to quite large changes in the values of the elasticity of home demand and the elasticity of supply due to all foreign producers is impressive. The maximum decrease in the value of  $\lambda$  (the gross savings in foreign currency per £ subsidy) at any of the above levels of h and r is less than 25 percent, when the elasticity of home demand is doubled, *ceteris paribus*. Similarly, the maximum increase in the value of  $\lambda$  associated with a doubling of the elasticity of supply due to all foreign producers, *ceteris paribus*, is 33 percent. When the elasticity of supply due to the home producer is doubled, *ceteris paribus*, the maximum increase in the value of  $\lambda$ , within the range of values of h and r given in Table 1, is slightly more than 60 percent.

<sup>5</sup> Whetham, E. H., *British Farming, 1939-49*, Nelson, 1952, p. 106. The usual index number problems are obviously relevant. The reader is welcome to use other indices.

price ratio of the food produced in Britain in 1954 could well have been .4 or even higher.<sup>6</sup> Assuming that the proportion of home produced "food" without price subsidies would have been much the same as prewar, that the average elasticity<sup>7</sup> of supply due to the home producer of "food" was 1, that the elasticity of supply due to all foreign producers of "food" was 2, and the elasticity of home demand for "food" was 0.5, the gross saving in foreign currency per £ product price subsidy would then have been less than £ .7, and the maximum gross saving in foreign currency from £250 million spent on price subsidies about £170 million.

### *Subsidy Allocation Among Commodities*

For fairly close substitutes (the relevant characteristics are, of course, the similarity of demand elasticities on the one hand and the two supply elasticities on the other) equality of the proportion originally home pro-

TABLE 2. PROPORTION HOME PRODUCED AND THE SUBSIDY-PRICE RATIO FOR SOME AGRICULTURAL PRODUCTS IN THE U. K. IN 1954

Commodity	Proportion Home Produced (h)	Subsidy-price ratio (r)
Potatoes	.96	.23
Sugar Beet	.29	.51
Beef and Veal	.77	.10
Mutton and Lamb	.39	.10
Pork (including Bacon)	.66	.33
Poultry	.77	0
Eggs	.87	.39
Milk	1.00	.47

Source:—Nash, E. F. "The Competitive Position of British Agriculture," *Jour. of Ag. Econ.*, Vol. XI. No. 3, Table VII, p. 232 and "The Sources of Our Food Supplies," *op. cit.*

duced would necessitate equality of the corresponding subsidy-price ratios for maximization of foreign currency saving in accordance with the relationship illustrated in Table 1.<sup>8</sup> A glance at Table 2 will show that the subsidy-price ratios listed are not all optimum for the saving of foreign currency.

<sup>6</sup> Derived from Professor E. F. Nash, "The Sources of Our Food Supplies" in "Agriculture in the British Economy," *Proc. of Conf., Imperial Chem. Indus.*, London, March, 1957, pp. 47-58, and *Official Statistics of Brit. Min. of Ag. Fish. and Food*. (See Table 3.) The net value of h would, of course, be higher still if we accept the improbability of self-sufficiency in such goods as tea, coffee, rubber.

<sup>7</sup> These elasticity assumptions are based on the "considered guesses" of the Committee of Provincial Agricultural Economists as given in a report to the British Ministry of Agriculture, Fisheries and Food.

<sup>8</sup> Professor E. F. Nash in "Some Reflections on Agricultural Policy," *Lloyds Bank Rev.*, July, 1956, p. 50, claimed that "unless some very clear reason can be shown, the ratio between the farm and the import-parity price should in general be the

### Animal Products

The subsidy-price ratio of .10 for mutton and lamb is a very rough estimate.<sup>9</sup> Nevertheless it is safe to say that the subsidy-price ratio for mutton and lamb is considerably lower than that for pork (including bacon). Whatever the rate of subsidy on mutton, moreover, it will inevitably include some subsidy on the complementary product, wool. The subsidy-price ratios shown in Table 2 for pork and mutton would have equalized the corresponding values of  $\lambda$  only if the two supply elasticities for pork were at least about four times the corresponding elasticities for mutton. It therefore seems probable that a tendency towards equalization of these two subsidy-price ratios would have increased the saving in foreign currency from a given total subsidy payment. With values for  $\lambda$  for beef and mutton of .77 and .39 respectively, equalization of subsidy-price ratios for these two commodities could not have been expected to maximize the saving in foreign currency due to product subsidies.

Similarly, even after relaxing the *ceteris paribus* assumption, one would expect that, with a higher proportion (.87) of the egg market supplied by the home producer than the corresponding proportion (.66) of the home market for pork, an increase in the saving of foreign currency would have been achieved by a reduction in the subsidy-price ratio for eggs (.39) relative to the subsidy-price ratio for pork (.33).

The original model assumes perfect competition whereas the Milk Marketing Board is a monopoly. One would therefore suspect that, even allowing for government price controls, the actual average price of milk in 1954 was higher than it would have been under perfect competition. Since home producers also supplied all the liquid milk consumed in the United Kingdom in 1954, there would have been no marginal saving in foreign currency from subsidizing the home production of liquid milk. Unless price discrimination could be made against milk for manufacture and the necessary facilities provided, without further subsidies, it therefore seems that reducing the subsidy-price ratio for milk would have increased the saving in foreign currency from a given subsidy payment to all farmers.

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same for all products if wasteful use of resources is to be avoided," i.e., the subsidy-price ratio for all products should be the same. So far as the saving in foreign currency is a reason for these subsidies, it has now been shown that the subsidy-price ratio is only one of a number of factors which must be considered. The actual subsidy-price ratios which would maximize the gross saving in foreign currency could, moreover, only be arrived at with the model evolved in this study by successive approximation since the proportion of each commodity produced *ex ante* must be known whereas only *ex post* data were available.

<sup>9</sup>Prices for mutton and lamb and beef and veal were not separately dissected by Professor Nash.



*Cereals*

Wheat can most usefully be thought of as wheat for milling (a separate commodity) and feed wheat (forming part of the commodity "feed grains"). Of the 1953 wheat crop, about two-thirds was used by millers and one-third elsewhere (Table 3).

TABLE 3. U. K. PRODUCTION AND IMPORTS OF CEREALS IN 1954 AND USES OF HOME-PRODUCED GRAINS

Grain	U.K. output 1953-54 '000 tons	Used by millers, malsters, & distillers '000 tons	Other uses '000 tons	Imports Y/E 31.12.54 '000 tons	Subsidy prices ratio <sup>a</sup>
Wheat	2,664	1,686	978	3,500	1.66
Barley	2,521	919	1,602	900	.42
Oats	2,821	157	2,664	22	.45
Other grain	911 <sup>1</sup>	—	911	1,450 <sup>2</sup>	
Total	8,917	2,762	6,155	5,872	

<sup>1</sup> Rye and mixed corn (i.e. mixed grain).

<sup>2</sup> Maize and sorghums.

<sup>3</sup> Corresponding subsidy-price ratios due to Nash (Source as for Tab. 2):—Wheat .61, Barley .27, Oats .45.

Source: *Official statistics of the Min. of Ag., Fish and Food.*

About half the home-grown wheat used by millers was used in the production of soft flour for biscuits etc.<sup>10</sup> The remaining half (about 800,000 tons at least) would have been used in flour for plant bakeries. Millers would have preferred a minimum of about 2,400,000 tons of imported hard wheat for blending with the latter. The actual imports of hard wheat for the year ending 31st December, 1954 as a guide, were 3,500,000 tons. Only 1,100,000 tons of imported wheat would therefore have been available for stock-feed.

Since the U.K. was using the maximum possible quantity of home-grown grain in flour production (there was still a surplus for other uses, mainly feed, of about 980,000 tons), there was no point in further subsidizing the home production of wheat for milling. Even allowing for a substantial contraction in home wheat production if all subsidies had been removed (including, of course, subsidies on other products), it is probable that, in terms of the expression for  $\lambda$ ,  $h$  would equal 1 for milling wheat. The whole of the wheat subsidy, therefore, was really applicable to the 980,000 odd tons available for feed and this subsidy-price ratio was about 1.66.

In a similar way, barley can be most usefully thought of as malting

<sup>10</sup> Information on cereals due to personal communication with millers.

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barley (a separate commodity) and feed barley (forming a further part of the commodity "grain for feed"). Nearly one-third of the 1953 barley crop was used by maltsters, millers and distillers. To the extent that brewers prefer local barley, any subsidy to the barley crop can likewise be thought to apply to the remaining two-thirds that would have been available for feed. It is therefore probable that the actual subsidy-price ratio for barley was about .42 or equal to the oats subsidy. For the purposes of saving foreign currency, however, a higher rate of subsidy for barley than for wheat would perhaps be justified, with the same elasticities of demand and supply, on the grounds that it would be necessary to maintain some subsidy on malting barley as well as feed barley in order to maintain a fairly high cross-elasticity of demand for the various imported grain feeding stuffs.

In the case of oats, almost the whole crop could be properly thought to be produced for feed. Although the imports of oats were negligible, the subsidizing of oats production could have been thought to assist the bargaining power of British buyers of feed in general. Compared with barley, the subsidy-price ratio for oats has therefore not been significantly understated at .45.

The total home production of feed grain to be sold in 1954 was thus about 6,000,000 tons, comprising 980,000 tons of wheat at a very high subsidy-price ratio (probably about 1.66), 1,600,000 tons of barley and 2,600,000 tons of oats at about the same subsidy-price ratio (.42 to .45) and 900,000 tons of other grain. Subsidizing the production of all this grain might have been thought to reduce the price paid for some 3,500,000 tons of imported feed grain. If one ignores the imports of more imperfect substitutes (some imported feeds such as oil-seeds, may even be partial complements) the value of  $h$  for feed grain would have been about .6.

There seems no particular reason why one grain produced for feed should be more heavily subsidized than another. (It is assumed that nutritional criteria were not limiting the demand for particular grains.) Since grain for feed comprised only one-third of the total wheat crop, two-thirds of the total barley crop and almost the whole of the other grain crops in the U.K., it therefore seems that a substantial reduction in the gross subsidy-price ratio of wheat relative to other grain crops would have increased the saving in foreign currency.

While cereals are one of the United Kingdom's heaviest imports from dollar areas,<sup>11</sup> transferring some of the subsidy on wheat to barley and oats would have been more effective in "saving dollars" as well as assisting to reduce the general deficit in the balance of payments. Imports of

<sup>11</sup> Nash, E. F., "The Sources of Our Food Supplies," *Op. cit.*

"dollar" wheat for bread were already at a minimum and the "savings" on feed grains would have been increased by this subsidy transfer.<sup>12</sup>

### *Other Crops*

About 96 percent of home requirements of potatoes were home grown; a shift in the subsidy on potatoes to other commodities would therefore have tended to save more foreign currency. Other crops have been omitted.<sup>13</sup>

### *All Agricultural Products*

The following adjustments<sup>14</sup> would therefore have increased the saving in foreign currency from the same total subsidy payment: (1) A reduction in the rate of subsidy on pork (and bacon), milk, wheat, potatoes and possibly eggs. (2) An increase in the subsidy on other products notably beef, mutton and lamb, and cereals other than wheat.

Since about 80 percent of the £250 million product subsidy payments was encouraging the production of commodities in group (1) above, the previously estimated maximum gross saving of £170 million could well be reduced to less than £100 million.

### *Net Saving in Foreign Currency*

It seems safe enough to assume that £250 million spent in other ways could have saved or earned more than £100 million of foreign currency, provided these payments did not encourage gross inefficiency. Subsidizing tourist expenditure is a ready example. Moreover, particularly to the extent that Britain's overseas trade is still mainly bilateral, a reduction in

<sup>12</sup> Vertical integration of some agricultural products tends to reduce the probability of equal subsidy-price ratios for all products maximizing the saving in foreign currency. It is probable that subsidizing the home production of "meat" for example, would have required the subsidizing of cereals (although at a lower rate than actually pertained). One could, indeed, argue further that the size of recent world grain "surpluses" placed the British consumer in such a strong bargaining position that the extra "saving" in foreign currency due to any subsidized home grain production would be negligible.

<sup>13</sup> There is difficulty in finding a suitable base for comparison with the sugar beet subsidy. Moreover, the growing and marketing of sugar beets are subject to a number of additional arbitrary controls. Tariffs on fruit and vegetables can be thought to correspond to price supports. It appears that a reduction in the rate of tariff on fresh vegetables other than tomatoes (with due allowance for seasonal variations in supplies and assuming the same import quotas) would save further foreign currency. The text, however, covers the main commodities.

<sup>14</sup> The above adjustments would have been in conformity with a prediction made by Dr. J. R. Raeburn in December, 1953 in *Changing Food Markets*, London and Cambridge Economic Bul., New Series, No. 8, p. iv, in "The Times Review of Industry." From estimates of probable conditions of demand and supply of livestock products in 1954, Dr. Raeburn then concluded that "pig, milk and egg producers may look forward with some fear to the expression of consumer demands in 1954-55."

food imports due to subsidized home production would have had its direct counterpart in the reduced demand for British exports such as automobiles. It therefore seems probable that the payment of about £250 million in product subsidies to British farmers in 1953-54 actually resulted in a marginal increase in the British balance of payments deficit, including a marginal increase in the dollar deficit.

## APPROACHES TO INTERNATIONAL TRADE UNDER NONPURE COMPETITION

### A Theoretical Framework for Analysis of Some Contemporary Problems of International Trade in Agricultural Products

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#### *Introduction and Setting*

SINCE 1914, and particularly since the Great Depression of the 1930's, the world trading system has been tending toward regional and bilateral patterns of trade. The "Free Trade Era," generally viewed as from 1815 to 1914, was especially favorable to a world-wide trading system because of the relative freedom that trade and financial transactions had from governmental controls.<sup>1</sup> Two world wars and a world depression changed many of the 19th century institutions which were conducive to "laissez faire" international trade. In many instances, state monopolies took over the performance of functions carried on by private market forces during the "Free Trade Era"; in other cases, different forms of restrictions were utilized to affect international trade directly or indirectly. Also, in the 1930's, large-scale international commodity agreements were introduced. All these changes in the pattern of trade substantially affected the movement of internationally traded agricultural products.

Examples of nonpure competition in international trade are well known. The world price of wheat is directly affected by monopolistic and monopsonistic forces exercised through the International Wheat Agreement. The production and marketing of tea is directly influenced by the governmental policies of Southeast Asian countries. Large government-held stocks of cotton, grain, and rice were accumulated in the United States as a result of our price-support and nonrecourse loans operations. These stocks have been reduced—some only after aggressive export programs were instituted. Imperfect competition in international trade of agricultural products during the past several decades has grown in the form of government-subsidized exports, bilateral trade agreements, bulk-purchase trading programs as well as controlled imports through quota systems

\* The writer would like to acknowledge the continuous encouragement and assistance of Professor Sidney Hoos.

<sup>1</sup> For a review of the changing pattern of world trade, see the National Planning Association, *The Political Economy of American Foreign Policy* (New York: Henry Holt and Company, 1955), pp. 19-54.



and foreign exchange control. In these forms of international trade, the traditional aspects of pure competition in their private market context are largely absent.

The Ricardian classical and neoclassical theories of international trade were based on the assumption of pure competition in the sale and purchase of internationally traded goods. From Ricardo on to Mill, Marshall, and Taussig, this particular assumption was never relaxed. Attention was directed to flexible exchange rates, to the reparations problem, the effects of tariffs on the gain from trade, the problem of devaluation, and others. But with the transformation in the competitive structure of world trade, the theory of international trade called for changes and modifications. The effects of monopoly and monopsony on international trade, however, have received analytical treatment only in comparatively recent times. Pioneer works in this branch of international economics were contributed, among others, by Viner,<sup>2</sup> McDiarmid,<sup>3</sup> Marsh,<sup>4</sup> Baldwin,<sup>5</sup> and Rangnekar.<sup>6</sup> Professor Viner examines the underlying reasons for the establishment of state monopolies and the consequent results. McDiarmid looks into the theories of international trade and imperfect competition, concluding that the domestic theory of imperfect competition can be applied in its basic form to the case of imperfect competition in international trade. Marsh, while developing a case of his own, agrees with McDiarmid. Baldwin is the first explicitly to apply the theory of imperfect competition to international trade. His work, although based on Leontief's ingenious model,<sup>7</sup> is a clear step toward an analysis of static equilibrium under conditions of imperfect competition in international trade. Rangnekar attempts to "restate the pure theory of international trade so as to bring it into line with the recent work on monopoly and imperfect competition."<sup>8</sup>

This paper briefly reports on some analytical methods we have developed for dealing with cases of market discrimination in international trade. Then we consider a problem involved in international commodity agreements such as the International Wheat Agreement where dynamic

<sup>2</sup> Viner, Jacob, "National Monopolies of Raw Materials," *The Causes of War* (New York: The Church Peace Union, 1932, edited by Arthur Porritt).

<sup>3</sup> McDiarmid, O. J., "Imperfect Competition and International Trade Theory," *Essays in Political Economy* (Toronto: University of Toronto Press, 1938), p. 117.

<sup>4</sup> Marsh, D. B., "The Scope of the Theory of International Trade Under Monopolistic Competition," *Quarterly Journal of Economics*, vol. 56, no. 3, May, 1942, p. 475.

<sup>5</sup> Baldwin, R. E., "Equilibrium in International Trade, A Diagrammatic Analysis," *Quarterly Journal of Economics*, vol. 62, no. 5, November, 1948, p. 748.

<sup>6</sup> Rangnekar, S. B., *Imperfect Competition in International Trade* (London: Oxford University Press, 1947, edited by J. J. Anjaria).

<sup>7</sup> Leontief, Wassily W., "The Use of Indifference Curves in the Analysis of International Trade," *Quarterly Journal of Economics*, vol. 47, no. 3, May, 1933, p. 493.

<sup>8</sup> Rangnekar, *op. cit.*, p. xii.

intertemporal considerations are dominant. We find these new developments in the theory of international trade helpful in the analysis of contemporary problems by providing a theoretical framework for setting forth hypotheses pertinent and meaningful in a system of international trade saturated with elements of nonpure competition.

### *Monopoly Allocation to Independent Markets*

Under conditions of pure competition and in the absence of international trade, the production of any commodity within any country will so be adjusted as to equate the real marginal cost (MC) of production to the social marginal rate of substitution (MS) with respect to the same good.<sup>9</sup> In equilibrium, the price (P) of the product will be equal to its marginal cost; hence, for a particular country

$$P_i = MC_i = MS_i$$

(where  $i = 1 \dots n$  commodities).

If international trade is introduced (and in the absence of transfer costs), the static equilibrium price of any good is equal in all the countries entering into trade with each other. Therefore, the marginal cost of producing that commodity and its social marginal rate of substitution will also—in equilibrium—be equal in all the countries. Or

$$P_{ij} = MC_{ij} = MS_{ij}$$

(Where  $i = 1 \dots n$  commodities and  $j = 1 \dots k$  countries). This proposition assumes, however, that the multilateral flow of goods between countries is unhindered and proceeds along the classical lines of pure competition. If we drop the assumption of pure competition between countries (in the domestic market free competition may still subsist), the equilibrium conditions will accordingly change. A country having a monopoly on the exports of one commodity<sup>10</sup> may adjust exports of that commodity so as to affect the world price and enjoy a larger share of the gains from trade. In such a case, the world price ( $P_w$ ) will not be equal to that in the producing country ( $P_m$ ); neither will the world social marginal rate of substitution ( $MS_w$ ) equal the exporting country's social marginal rate of

<sup>9</sup> In our analysis we shall use the Austrian approach as outlined by Lerner, A. P., "The Diagrammatic Representation of Cost Conditions in International Trade," *Economica*, vol. XII, no. 37, 1932, p. 346; Leontief, *op. cit.*; and Haberler, G., *The Theory of International Trade* (London: Macmillan and Co., Ltd., 1937), ch. XII.

<sup>10</sup> The Union of South Africa, for example, is practically the sole supplier of oranges to Western Europe during the summer months. Imports of oranges into Western Europe from the United States have been limited due to exchange restrictions. (The formulations sketched in this paper are based on and are part of the theoretical framework being developed and used in a study on international trade in citrus.)

substitution ( $MS_m$ ). The exporting monopoly, to maximize its gain, would equate the domestic price with the marginal revenue associated with the world market ( $MR_w$ ). For the exporting country, the necessary equilibrium conditions are:

$$P_m = MC_m = MS_m = MR_w;$$

in the rest of the world, the necessary equilibrium conditions are:

$$P_w = MS_w.^{11}$$

This case of an exporting monopoly facing the rest of the world is based on Baldwin.<sup>12</sup> With modifications of his analysis, we develop the case of market discrimination where the monopoly exporter may sell to more than one importing market.

We assume that the monopoly-exporting country may ship its product to one or all of several independent markets. Each of these markets may be charged a different price; therefore, the same rule that applies in the domestic market will also apply in the international market. The monopolist exporter, to maximize his gains from trade, will so adjust his exports as to equate his marginal cost with the marginal revenue associated with each of the independent markets.<sup>13</sup> Consequent upon this action of the monopolist-exporting country, its social marginal rate of substitution will differ from that of the rest of the world. Also, each of the independent markets may have different social marginal rates of substitution. For the monopolistic country, the necessary equilibrium conditions are:

$$P_m = MC_m = MS_m = MR_1 = MR_2 = \dots = MR_k$$

and for *each* of the independent markets, the necessary equilibrium condition is

$$P_j = MS_j.$$

The corresponding geometrical analysis of an exporting-monopoly selling to three independent markets is presented on Figure 1.<sup>14</sup>

<sup>11</sup> No further consideration is given to the marginal cost of producing that commodity in the rest of the world since, by assumption, only the exporting country produces this commodity.

<sup>12</sup> Baldwin, *op. cit.*

<sup>13</sup> See Robinson, J., *The Economics of Imperfect Competition* (London: Macmillan and Co., Ltd., 1948), ch. 15, p. 179. Our case, however, includes the social marginal rate of substitution which is absent from Mrs. Robinson's formulation. The social marginal rate of substitution is the connecting link between the domestic market and the other markets, a link which is unnecessary in Mrs. Robinson's case.

<sup>14</sup> An envelope (FHLE) of the first market's reciprocal demand curve (MLS) is constructed by tracing the locus of tangencies between the reciprocal demand curve and the indifference curves as the reciprocal demand curve is moved with its origin on the monopolist-exporter's transformation curve (CD). This locus of points represents the highest consumption points that the exporter may reach for different pro-

### *A Mixture of Trade Between Bilateral Agreements and Pure Competition*

We now analyze the case where one country is exporting some of its product through bilateral agreements and selling the rest of its exports under pure competition.<sup>15</sup> In other terms, the exporting country is faced with a world price for part of its export while the prices in certain of its markets have to be negotiated.

The current status of conventional economic theory, in dealing with bilateral monopoly, has been recently characterized in the following terms:

"... ordinary economic theory is unable to predict the terms on which agreements tend to be reached in cases ... of bilateral monopoly, and in general in situations where agreements must be arrived at by means of explicit or implicit bargaining. ... Still less is economic theory ... able to predict on what terms agreements tend to be reached in situations where one or both of the two bargaining parties use political pressure as one of the bargaining weapons."<sup>16</sup>

According to such a view, we cannot say much about the general results of the bilateral negotiations. We are able, however, to compare the respective prices in the home market, in the free market, and in the closed markets dealt with through bilateral agreements. If the price in the home market is higher than the price in the free market, an adjustment will take place and the commodity will be imported from the free market until the two prices are equal; the reverse adjustment will take place if the price

duction combinations. The slope of the envelope is the marginal revenue associated with the first market ( $MR_1$ ). On top of the envelope constructed for the first market (FHLE), additional envelopes (HZPG and ZTW) are constructed on top of each other to account for each of the independent markets involved. The final equilibrium consumption point for the monopolist-exporter is given by T, and M indicates the final production point. Baldwin has shown (*op. cit.*, p. 754), while developing the simple monopoly case, that the slope at any point on the envelope is equal to the slope of the base curve on top of which the envelope has been constructed, when a reciprocal demand curve has its origin on the base curve and is tangent to the envelope, at these particular points. Thus, the slopes at the points M, L, P, and T are equal and  $MC_m = MS_m (= P_m) = MR_1 = MR_2 = MR_3$ . The points M and T indicate the total amounts to be exchanged between the monopolist-exporter and the independent markets. The quantities exchanged with each individual market are defined by the line connecting two optimum points of consumption and the respective position of the consumption points. The abscissa is equal to the exports (MK, LN, and PQ, respectively), the ordinate to the imports (KL, NP, and QT, respectively), and the slope of the straight line connecting the two consumption points is equal to the price ratio at which the exchange takes place with each of the independent markets involved. Several T's exist representing different orderings of the markets; the highest T will be the optimum one and represents the largest share of the gains from trade which the monopolist-exporting country may enjoy.

<sup>15</sup> This is a rather common case. Many countries are still buying through bilateral agreements while others have removed such restrictions.

<sup>16</sup> Harrangi, John C., "Approaches to the Bargaining Problem Before and After the Theory of Games: A Critical Discussion of Zeuthen's, Hicks', and Nash's Theories," *Economica*, vol. 24, no. 2, April, 1956, p. 144.

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in the home market is lower than that prevailing in the free market. Starting with the assumption that the price in the free market is equal to the price in the home market, the proceeds obtained by the exporting country through bilateral agreements must be at least as high as those obtained in the free market. The free market price thus constitutes, in Pigouvian terms, the "maximum concession point" of the exporter. No price below the free market price will be acceptable to the exporting country. Furthermore, no longer can we deduce whether the price agreed upon through bilateral agreements will be equal to the social marginal rate of substitution. If the agreed price will be equal to the social marginal rate of substitution in the exporting country, then the negotiated price must be the same as that prevailing in the free market. In addition, nothing can be deduced about the relationship of the negotiated price to the social marginal rate of substitution in the "other" or importing countries. However, two possibilities emerge: (1) the price in the free market will be equal to the price agreed upon through bilateral negotiations and (2) the negotiated price will be higher than that in the free market.

In the first case, the exporting country may or may not enjoy any of the

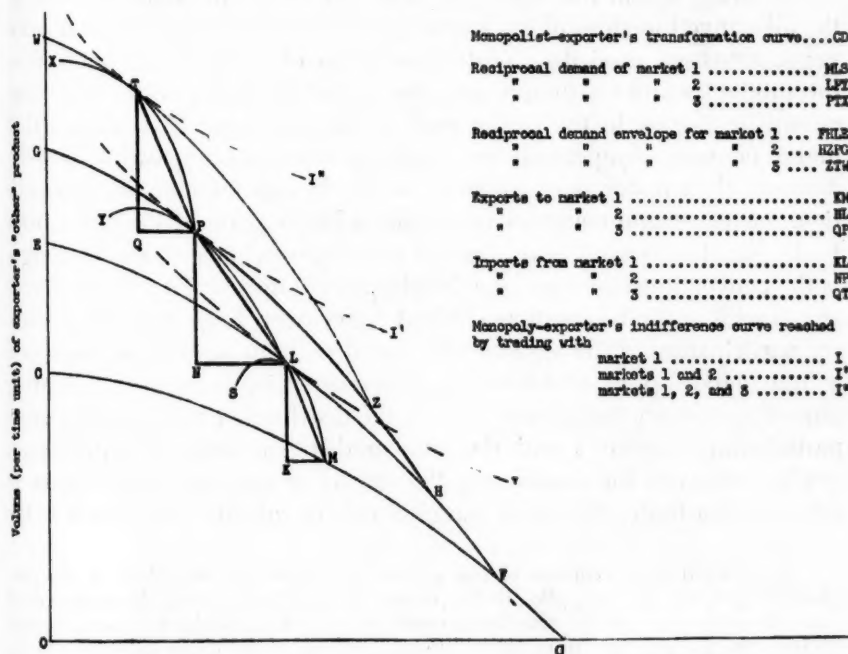


FIGURE 1. EQUILIBRIUM SOLUTION OF MARKET DISCRIMINATION BY MONOPOLIST-EXPORTER



gains from trade; in the second case, it certainly will. In case (1) the consumers in the importing country will pay the same price as those in the free market; but in case (2) higher prices would be paid by the consumers in the importing country which negotiates its trade through bilateral agreements. Hence, the consumers in the importing countries will have their real income reduced if their country enters into bilateral trade agreements instead of multilateral trade when there exists a free world market for this particular commodity.

### *Equilibrium Under International Commodity Agreements*

By drawing on the preceding discussion, we focus on a problem associated with an agreement of the International Wheat Agreement type. According to the International Wheat Agreement, each participating importing country commits itself to purchase a certain quantity of wheat at a certain maximum price, while the signatory exporting countries commit themselves to sell a certain amount of wheat at a certain minimum price. The maximum and minimum prices determine the "price range" and the committed quantities, the share of the market to be covered by the agreement. The underlying reason for not committing all of the wheat is that the agreement does not intend to eliminate entirely the allocative functions of the free market mechanism. The seasonal price negotiations are carried on under conditions of nonpure competition as the producers and consumers are represented by monopolistic and monopsonistic agents. In the earlier part of the paper, we have shown that under nonpure competition the resulting equilibrium position will be different than under pure competition. In the case of nonpure competition, one or several countries may enjoy a larger share of the gains from trade than they would have enjoyed under pure competition. No longer is the conventional concept of a "world price"<sup>17</sup> appropriate under agreements such as the International Wheat Agreement. Each importing country participating in the agreement is faced with an agreement price and a "free market" price, and the over-all average price to each participating importing country varies according to the distribution of its takings from participating exporters and the free market. In terms of equilibrium criteria, relevant for considering the effects of nonpure competition in international trade, the social marginal rate of substitution—which is the

<sup>17</sup> The "world price" consists of two prices. The upper or lower limit of the prespecified "price range" is applied to the precommitted quantity while the market itself determines the price of the remaining, uncommitted wheat. If the free market price is above the prespecified "price range," the upper limit of the range will apply to the precommitted quantity; if the free market price is lower than the prespecified range, the lower limit applies. A weighted average of the prespecified and free market prices constitutes the "average" world price.

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link between the domestic market and the world market—will differ among countries.

By using necessary equilibrium conditions under pure competition (outlined earlier) as a criterion for evaluating the International Wheat Agreement, one can conclude that the agreement does not satisfy those conditions. One may posit, however, that for evaluating such agreements not only a nonpure competition framework but also one that permits analysis of a dynamic phenomenon is necessary.

The prespecified "price range" and the precommitted quantities are reconsidered ahead of each season. This permits continuous changes in the relevant variables and suggests the use of a dynamic rather than a static framework. A dynamic intertemporal analysis is called for to specify the necessary conditions for the dynamic equilibrium of international trade under conditions of nonpure as well as pure competition. Further, the long-run effects of an agreement need not be the same as in the short run. A meaningful long-run equilibrium outcome of the adjustment process can be deduced, *a priori*, only by a dynamic intertemporal analysis of international trade under nonpure competition—an area that yet remains to be investigated vigorously.

### *Conclusion*

We have sketched the theoretical formulations and static equilibrium solutions of two types of situations prevalent in the contemporary state of nonpure competition in a large part of international trade and for which conventional theory of international trade, because of its dependence on the assumption of pure competition, is inadequate. Also, for a third type of contemporary international trade, we have considered serious limitations of the approaches used in the analysis of that type of trading. As in the theory of the firm, and in general value and price theory, the recognition and analytical development of nonpure competition and its special characteristics in international trade are necessary to provide a logical framework helpful for deductive analysis, empirical research, and policy considerations.

## AN AGGREGATE SUPPLY FUNCTION FOR NEW ZEALAND WHEAT

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NEW ZEALAND'S supply of wheat is produced predominantly in the low rainfall areas of the South Island. It is produced on mixed farms which typically rely on fat lamb, or small seeds<sup>1</sup> to provide the major revenue. The harvests 1920 to 1953 have been studied, in an attempt to estimate the supply function for New Zealand wheat. The acreage sown to wheat has varied between 90,000 and 350,000 acres over this period, so that it is evident that farmers *do* change their production plans, at least in this area, according to changes in economic conditions. The estimates of the supply function reported here are linear in the original figures. Some attempt has been made to deal with the problem of multicollinearity and autocorrelation of the error term.<sup>2</sup>

### *A Typical Wheat Farm*

The bulk of New Zealand's wheat supply comes from the fat lamb farms of the South Island provinces of Canterbury, Otago, and Southland. The rainfall in these areas is insufficient to permit the high producing permanent perennial ryegrass and white clover pastures typical of the rest of the country. In these low rainfall areas pastures tend to "run out" after three to five years, a green crop and one or two cash crops may then be taken before the land is again sown to pasture. The cash crop is usually wheat, but oats and barley are also grown. Wheat is not included in a rigidly fixed rotation, but is one crop in a flexible system which can only be described as a "rotation" in the sense that a period in pasture is followed by a period of cropping. New Zealand lies in the southern hemisphere, hence, harvesting takes place in January-February, while preparation for the main, autumn, planting is commenced in March and April.

### *A Single Equation*

An equation is identified and is in reduced form<sup>3</sup> if there is no other relation in which one of the independent (or explanatory) variables is a function of the dependent variable.

<sup>1</sup> Grass and clover seeds, especially ryegrass, white clover, and red clover.

<sup>2</sup> These problems are discussed more fully in "A Study of the Aggregate Supply Function of New Zealand Wheat," W. Candler, Unpublished thesis, Massey Agricultural College, Palmerston North, New Zealand.

<sup>3</sup> T. J. Koopmans, "Identification Problems in Economic Model Construction," Chap. II of *Studies in Econometric Method*, Ed. W. C. Hood and T. J. Koopmans. G. Tintner, *Econometrics*, p. 155 ff.

The equations presented here have wheat acreage as the dependent variable. The independent variables are the factors that affect the production decision that results in the dependent variable (wheat acreage). Wheat acreage, which is the result of the production decision, cannot be used to "explain" any of the factors that led to the decision.<sup>4</sup> In particular, the decision that led to a certain acreage of wheat being harvested in January-February of 1922 was taken in March-April of 1921. The events of January-February 1922 may affect conditions in March-April 1922, and hence the 1923 harvest, but they cannot be responsible for events in the *previous* March-April.<sup>5</sup> This simple argument was used to justify the estimation of the structural coefficients by the use of a single equation.

### *The Variables Used*

The acreage sown to wheat was taken as the dependent variable, rather than the bushels harvested, as it was thought that this would give the best estimate of farmers production intentions. These production intentions form the *economic* portion of the supply function.

Ten independent variables were considered, these were the price of wheat, of fat lamb, of wool, of oats, of barley, of ryegrass seed, of white clover seed; the acreage of red clover; the rainfall (number of rainy days in April); and the acreage of wheat in the previous season. The theoretical justification for the price variables has already been implied in the discussion of a typical New Zealand wheat farm. The inclusion of red clover *acreage* was due to the harvesting of this crop occurring so late in the season that it may interfere with the preparation of land for wheat. The number of rainy days in April was included because wet weather at planting time may prevent farmers being able, or possibly willing, to work their land. The inclusion of the wheat acreage in the previous season allows for the fact that in the short run, between years, farmers production decisions are not independent. In the simplest case, the fact that 350,000 acres was harvested last year means that there is sufficient machinery and experience on farms to produce this acreage. Table 1 gives the zero-order correlation coefficients between the various independent variables, and between these variables and the dependent.

The correlation between wheat price and wheat acreage is negative,

<sup>4</sup>T. J. Koopmans, "Statistical Estimation of Simultaneous Economic Relations," *Journal of the American Statistical Association*, Vol. 40, 1945, p. 459 ff.

<sup>5</sup>It should perhaps be emphasized that the wheat price used to "explain" a particular harvest was the price known by farmers when the crop was planted. In some years this was the price paid for the crop which had just been harvested, and in others it was the future price which would be paid for the crop when harvested (i.e., in some years the government announced the price to be paid before planting). In either case the price known at planting would be independent of the acreage actually planted.

TABLE I. ZERO-ORDER CORRELATION COEFFICIENTS AMONG THE VARIABLES EXPRESSED IN THEIR ORIGINAL FORM.  
OBSERVATIONS FOR THE HARVESTS 1920-1933.

$r_{ij} =$	a	b	c	d	e	f	g	h	i	j	k	l	m
i = a	+1.000	-0.002	-0.692	-0.597	-0.718	-0.530	-0.662	-0.529	-0.484	-0.558	+0.685	+0.286	-0.640
b		+1.000	+0.794	+0.709	+0.883	+0.806	+0.861	+0.661	+0.270	+0.379	-0.777		
c			+1.000	+0.962	+0.821	+0.662	+0.787	+0.589	+0.253	+0.370	-0.597		
d				+1.000	+0.730	+0.564	+0.756	+0.566	+0.191	+0.308	-0.484		
e					+1.000	+0.772	+0.848	+0.660	+0.359	+0.457	-0.780		
f						+1.000	+0.708	+0.576	+0.176	+0.373	-0.738		
g							+1.000	+0.782	+0.327	+0.453	-0.715		
h								+1.000	+0.656	+0.415	-0.464		
i									+1.000	+0.514	-0.273		
j										+1.000	-0.408		
k											+1.000		

**Symbols:**

- Xa = Wheat acreage in original figures.  
 Xb = Wheat price in original figures.  
 Xc = Fat lamb price in original figures.  
 Xd = Wool price in original figures.  
 Xe = Oat price in original figures.  
 Xf = Barley price in original figures.  
 Xg = Ryegrass price in original figures.  
 Xh = White clover price in original figures.  
 Xi = Red clover acreage in original figures.  
 Xj = Number of rainy days in April in original figures.  
 Xk = Last year's wheat acreage in original figures.  
 Xl = Oat acreage in original figures.  
 Xm = Barley acreage in original figures.

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it has the "wrong" sign. This indicates that over the period studied, the gross relation has been a high wheat acreage associated with a low price. This rather surprising gross relationship is due to government interference with the price of wheat. Since the first world war New Zealand has been, essentially, a wheat importer, and the price of wheat has been determined either by direct government control or indirectly by the tariff on wheat imports. Government interference has resulted in the fluctuations that would be associated with a free price being damped. Thus, during the depression there was a slight fall in the price of wheat, while wool, meat, and other prices fell much further; at this time a fall in the absolute price of wheat was associated with a rise in its relative price. Similarly the war and postwar inflation has resulted in an increase in the absolute level of wheat price at a time when the relative price of wheat was falling. Table 1 shows that some of the independent variables were quite highly correlated; that they were multicollinear. In this study a correlation among independent variables with a modulus in excess of 0.8 has been taken as *prima facie* evidence of multicollinearity between the two variables. Where two or more variables were multicollinear in this sense one or more of them was suppressed, the variable to be suppressed was selected on theoretical grounds. The first choice was between the price of fat lamb and the price of wool, the correlation coefficient being +0.962. Since fat lamb contributes much more towards the income of the farming areas concerned than does the price of wool, the price of fat lamb was used. Some of the "explanation" due to the price of fat lamb, may have been provided by the price of wool. The second choice was between the prices of barley and ryegrass seed and the price of wheat, the two correlation coefficients concerned are +0.806 and +0.861 respectively. Despite the "wrong" sign for the gross wheat price and wheat acreage relationship, wheat price is felt to be of sufficient (theoretical) importance in the explanation of wheat acreage to justify the suppression of the prices of barley and ryegrass as explanatory variables. When the tenuous relationship with the "right" sign is being interpreted, the confounding of the wheat price variable with these others should be remembered.

Examination of the relationship between the acreage of wheat and the acreage of oats showed that not only had their absolute magnitude been associated over the period considered, but also that they had changed together, their first differences were positively correlated. This was interpreted to mean that the apparent effect of a high oat price in reducing the acreage in wheat could not be substantiated, since there was no evidence of oat production having been substituted for wheat production. This led to oat price being rejected as an explanatory variable.

The empirical relationships between the ten plausible explanatory

variables led to the rejection of four of them, leaving the price of wheat, fat lamb, and white clover, the rainfall, the acreage of red clover and the acreage of wheat in the previous year as the only explanatory variables.

### *Multicollinearity*

The most blatant cases of multicollinearity were removed before the main problem of estimation was tackled. There remained, however, a considerable amount of multicollinearity. As is well known, multicollinearity leads to large standard errors<sup>6</sup> and this sets a limit on the degree of multicollinearity consistent with all regression coefficients being significant at a particular probability level. In the present study two estimates of the supply function were obtained using an unusually lenient criterion of significance. This criterion merely demands that the partial regression coefficient should be larger than its standard error.<sup>7</sup> In this study this corresponds to approximately the 63% level of significance. No claim can be made that estimates derived from these "lenient" equations are very reliable, in certain circumstances however, they may be better than any other estimates derived. Other estimates of the supply relation were made using the more usual 95% probability level. The 95% level of significance has been referred to as the "strict criterion," as different from the "lenient criterion" discussed above.

### *The Lenient Criterion*

The first relation obtained using the lenient criterion involved wheat acreage ( $X_a$ ), wheat price ( $X_b$ ), fat lamb price ( $X_c$ ), red clover acreage ( $X_i$ ), rainfall ( $X_j$ ), and last year's wheat acreage ( $X_k$ ).<sup>8</sup> The equation was:

$$(1) X_a = 155.0 + 0.269 X_b - 0.108 X_c - 0.145 X_i - 3.246 X_j + 0.507 X_k$$

$$(0.165) \quad (0.032) \quad (0.079) \quad (2.334) \quad (0.167)$$

$$R^2 = 0.713 \quad "d" = 1.790$$

In this relation  $X_c$  and  $X_k$  are significant even according to the strict criterion.  $X_b$  is not significant at the 95% level. In original figures a positive partial regression coefficient for  $X_b$  and significance at the 95% level appeared incompatible.  $X_i$  becomes significant at the 95% level if  $X_b$  and  $X_j$  are suppressed while  $X_j$  becomes significant if  $X_b$  and  $X_i$  are sup-

<sup>6</sup> See Haavelmo, "Remarks on Frisch's Confluence Analysis and Its Use in Econometrics," *Statistical Inference in Dynamic Economic Models* (Koopmans Ed.), p. 258 ff.

<sup>7</sup> This more lenient criterion is suggested by Wold in Wold and Jureen, *Demand Analysis*, p. 246.

<sup>8</sup> The sources of the data used to represent the above variables are described in the Appendix at the end of the article. The variables rejected have not been described in detail, however a full description of these variables is available in the thesis quoted in footnote 2 of page 1.

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pressed. It appears that  $X_i$  and  $X_j$  are to some extent multicollinear. The coefficient of multiple determination,  $R^2$ , is not very satisfactory for prediction. The "d" statistic<sup>9</sup> is quite satisfactory and indicates that the residuals are approximately random. White clover price,  $X_h$ , was not found to be a useful explanatory variable.

### *The Strict Criterion*

Using the strict criterion, two alternative relations are obtained.  $X_i$  and  $X_j$  are too highly correlated to be able to pass the strict criterion when both are included in the same relation. As these two variables are of equal theoretical merit, it was decided to derive two relations, the first includes wheat acreage ( $X_a$ ), fat lamb price ( $X_c$ ), red clover acreage ( $X_i$ ), and last year's wheat acreage ( $X_k$ ), the second includes the same variables except that red clover acreage ( $X_i$ ) was replaced by rainfall (number of rainy days in April) ( $X_j$ ). The two relations were:

$$(2) X_a = 216.9 - 0.078 X_c - 0.192 X_i + 0.380 X_k; R^2 = 0.666; "d" = 1.542$$

(0.026)      (0.074)      (0.135)

$$(3) X_a = 245.2 - 0.076 X_c - 5.192 X_j + 0.352 X_k; R^2 = 0.655; "d" = 1.470$$

(0.026)      (2.210)      (0.140)

Apart from the fact that the variables pass the strict criterion for significance, these two relations are most unsatisfactory. The coefficients of multiple determination are too low to inspire confidence in prediction based upon these equations, and the residuals are autocorrelated. Replacing  $X_i$  with  $X_j$  makes little difference to the value of the coefficients occurring with  $X_c$  and  $X_k$ . All the coefficients in (2) and (3) differ markedly from the coefficients obtained by using the lenient criterion.

In relations (2) and (3) only one price occurs, fat lamb price, and it was felt that "trend" might be leading to some of the variables having inflated partial correlation coefficients. Time was not significant at the 95% level, and did not greatly reduce the significance of the other variables or alter their regression coefficients in a marked manner.

In equations (1) to (3), the two largest residuals occur in the first three years. These years were deleted and new estimates of the supply function obtained. If there was a change in structure after the 1923 harvest, then obviously these new estimates would be more accurate than the one's given above. A number of plausible hypotheses could be put forward to account for a change in structure in 1923, but results are presented without further comment.

<sup>9</sup> Durbin and Watson, "Testing for Non-serial Correlation in Least Squares Regression," *Biometrika*, Vol. 37 (1950), p. 409 ff.

*The Shorter Series, Lenient Criterion*

In the shorter series (the harvests from 1924 through 1953) wheat price had ceased to be significant, even at the lower level of significance. Thus the relation obtained was:

$$(4) X_a = 222.6 - 0.067 X_c - 0.123 X_i - 2.977 X_j + 0.392 X_k; R^2 = 0.810$$

(0.019)      (0.063)      (1.799)      (0.104)      "d" = 1.258

In this equation the coefficient of multiple determination is satisfactory, though not very good, for prediction. The residuals, on the other hand, are markedly different from random.

*The Shorter Series, Strict Criterion*

In (4),  $X_i$  and  $X_j$  are not significant at the 95% level, each of them becomes significant if the other is suppressed. The resulting relations are:

$$(5) X_a = 198.5 - 0.072 X_c - 0.171 X_i + 0.418 X_k; R^2 = 0.791;$$

(0.019)      (0.058)      (0.106)      "d" = 1.270

$$(6) X_a = 215.4 - 0.067 X_c - 4.596 X_j + 0.416 X_k; R^2 = 0.783;$$

(0.020)      (1.676)      (0.108)      "d" = 1.247

The "d" statistics for these two equations indicate that the residuals are nonrandom. The coefficients of multiple determination would not inspire confidence even if these equations were to be used only for prediction. The coefficients of  $X_c$  and  $X_k$  remain remarkably stable in the three equations (4), (5) and (6), while the coefficients of  $X_i$  and  $X_j$  shift as befits coefficients of series that are, in some degree, multicollinear.

The "d" statistic of 1.270 in equation (5) suggests that the residuals are autocorrelated. In the next section the model has been altered to make specific allowance for this autocorrelation.

*Autocorrelation of the Residual*

The standard assumption of independent normally distributed residuals with mean zero and constant variance has been made. An alternative hypothesis would be that the residuals are autocorrelated, but when this autocorrelation has been allowed for a random residual would be obtained. Thus, the formal model for equation (5) can be expressed:

$$(5a) X_{at} = K + b_{ac}X_{ct} + b_{ai}X_{it} + b_{ak}X_{kt} + U_t.$$

$$(5b) E(U_t) = 0; \quad E(U_t^2) = \sigma_u^2$$

Where  $U_t$  is the residual in period  $t$ .

An alternative specification of this equation<sup>10</sup> is:

<sup>10</sup> D. Cochrane and G. H. Orcutt, "Application of Least Squares Regression to Relationships Containing Autocorrelated Error Terms," *Journal of the American Statistical Association*, Vol. 44 (1949), p. 32 ff.

$$(7a) X_{at} = K + b_{ac}X_{ct} + b_{al}X_{lt} + b_{ak}X_{kt} + U_t$$

$$(7b) U_t = \rho U_{t-1} + V_t$$

$$(7c) E(V_t) = 0; \quad E(V_t^2) = \sigma_v^2$$

The  $V_t$ 's are assumed to be a random series, normally distributed with mean zero and constant variance. Substituting (7b) into (7a) gives:

$$(7d) X_{at} = K + b_{ac}X_{ct} + b_{al}X_{lt} + b_{ak}X_{kt} + \rho U_{t-1} + V_t$$

If (7a) for the period  $t-1$  is multiplied by  $\rho$ , the autoregression coefficient, and subtracted from (7d), the result is:

$$(7e) X_{at} - \rho X_{at-1} = K(1 - \rho) + b_{ac}(X_{ct} - \rho X_{ct-1}) + b_{al}(X_{lt} - \rho X_{lt-1}) + b_{ak}(X_{kt} - \rho X_{kt-1}) + V_t$$

This eliminates  $U_{t-1}$  and leaves only the random residual  $V_t$ . (7e) may be solved by ordinary least-squares methods to give estimates of the coefficients  $b_{ac}$ ,  $b_{al}$ ,  $b_{ak}$  in terms of the observations  $X_{at}$ ,  $X_{ct}$ ,  $X_{lt}$ ,  $X_{kt}$ , and the autoregression coefficient  $\rho$ . The estimates of the regression coefficients may be substituted into (7e) giving a polynomial in  $\rho$ .  $\rho$  may be obtained as a root of this polynomial and can be substituted into the estimates of the regression coefficients to get their numerical values.

A root to the polynomial is  $\rho$  may be obtained by an iterative process. The resulting estimate is not necessarily a maximum likelihood solution, as only one of the roots of the polynomial is obtained.

The system (5a) - (5b), corresponding to (5) was respecified as (7a) - (7c), and the iterative procedure applied. The resulting estimate was:

$$(7) \begin{cases} X_{at} = 203.5 - 0.073X_{ct} - 0.176X_{lt} + 0.403X_{kt} + U_t \\ \quad \quad \quad (0.015) \quad (0.055) \quad (0.092) \\ U_t = 0.36 U_{t-1} + V_t; R^2 = 0.812; "d" = 1.795 \end{cases}$$

From a statistical point of view this relation is much more satisfactory than any of the other ones derived. The coefficients are significant at the 99% level of significance, the residuals are approximately random, and the coefficient of multiple determination is 0.81.

### *Confluence Analysis<sup>11</sup>*

Bunch maps were prepared from the shorter series data. These maps indicated that the use of more than one explanatory variable is either "superfluous," or actually "detrimental." No claim can be made that any of the relations included in this study have "good" bunch maps.

<sup>11</sup> R. Frisch, *Statistical Confluence Analysis by Means of Complete Regression System*, (Oslo, 1934).



*Prediction When the Future Is Similar to the Past*

If the interrelationships among the independent variables continue to hold in the future, then fairly satisfactory prediction can be obtained from equations whose individual coefficients are very poor estimates of the population parameters. For this situation equation (7) with its comparatively high  $R^2$  and random residuals would probably provide the best prediction.

*Prediction When the Future Differs from the Past*

When the interrelationships among the independent variables cease to hold in the future, the problem of prediction begins to be a matter of intelligent guesswork. If the correlation between red clover acreage and rainfall reflected in a correlation coefficient of 0.514 were to cease to hold, "mechanical" prediction would be less reliable than if they continued to move together. The data do not make it clear if rainfall really affects wheat acreage, or whether rainfall leads to a large  $R^2$  because it is a fairly good index of red clover acreage, or vice versa. Red clover acreage is determined in November; it is hardly credible that there is some structural relationship connecting it to rainfall in the following April. One way of getting an indication of the likely acreage would be to predict acreage using equation (4) to (7), this would at least indicate a region within which acreage could be expected to lie. With this information a more intelligent guess might be possible than in the absence of any evidence of the results of different hypotheses.

If red clover acreage is really responsible for alterations in the dependent variable, then equation (5) will provide the best prediction. If rainfall is really responsible then equation (6) will be the best equation, while if they are both important, then the best prediction probably will be given by (4). As soon as movements in these two variables cease to be correlated, there should be no difficulty in establishing the structural relationships.

Equation (1) provides some evidence of the effect of wheat price upon production decisions, when allowance has been made for the associated movement in fat lamb price. Little reliance could be placed upon this estimate, however, as it is only significant at the 63% level, and this significance is based largely on reduction of the large residuals in the first three years of the series. If this significance were the result of reducing errors in the *last* three years of the series more confidence could be placed in the coefficient obtained.

*Alteration of Wheat Acreage*

From time to time, the view has been expressed in New Zealand, that steps should be taken to ensure that the country be self-sufficient with

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respect to wheat. This view was particularly popular among wheat farmers in the 1930s. Table 2 indicates the change in each of the independent variables required to produce an increase of 1,000 acres in wheat, as estimated in the seven equations.

Table 2 illustrates the fact that there are three main ways the govern-

TABLE 2. CHANGE IN THE INDEPENDENT VARIABLES NECESSARY TO INCREASE WHEAT ACREAGE BY 1,000 ACRES

Equation no.	Estimate of					
	Wheat price: pence/bu.	Fat lamb price: pence/lb.	Red clover acreage: 1000 acres	Rainfall: days wet at Lincoln	Last year's acreage: 1000 acres	Last year's error: <sup>1</sup> 1000 acres
1	+0.929	-0.116	-0.690	-0.308	+1.972	—
2	—	-0.160	-0.521	—	+2.632	—
3	—	-0.164	—	-0.193	+2.841	—
4	—	-0.187	-0.813	-0.336	+2.551	—
5	—	-0.174	-0.585	—	+2.392	—
6	—	-0.187	—	-0.218	+2.404	—
7	—	-0.171	-0.568	—	+2.481	+2.778

<sup>1</sup> The expression "last year's error" needs to be explained further. This refers to the "error of prediction" which would have occurred in the previous time period of the autoregression of the error term had been neglected. An "error" of 2,778 acres, obtained in this way, in one time period tends to be associated with an increase in the acreage of wheat of 1,000 acres in the succeeding period.

ment could increase wheat acreage: by paying more for wheat, by reducing receipts from fat lamb, or by reducing the area sown to red clover. Probably the most effective policy would be a levy on fat lamb in the wheat producing provinces, the resulting income to be paid back to farmers in the form of an increased price for wheat. The "multiplier effect" of last year's wheat acreage means that the levy necessary to maintain a certain wheat acreage would be less than that needed to produce the same acreage in a year following a period of low wheat acreages. As the government proceeded to put this policy into effect, much improved estimates of the structural relations could be obtained since wheat and fat lamb prices would tend to move in opposite directions.

## APPENDIX

SOURCE OF DATA<sup>1</sup>

Variable	Symbol	Source
Wheat acreage	Xa	This is the total acreage of wheat threshed in the relevant year. The series was obtained from the <i>Agricultural and Pastoral Statistics of the Government Statistician</i> . The unit is 1,000 acres.
Wheat price	Xb	This series was supplied by the wheat Committee, and is generally considered to be the official series of prices. <sup>2</sup> The unit is ½d per bushel. The figure which corresponds to the 1922 harvest is the price in March 1921.
Fat lamb price	Xc	This series represents the meat schedule for grade II fat lamb up to 36 lbs. As this series does not go back before 1926, the first seven years have been extrapolated by the use of Ad-dington Market price for prime fat lamb. The unit is 1/80d. per pound. The price refers to the March prior to harvesting.
Red clover acreage	Xi	The acreage is as recorded in the <i>Agricultural and Pastoral Statistics of the Government Stat-istician</i> . The unit is 100 acres. For the 1922 wheat harvest the red clover acreage figure represents the acreage in the ground November 1920–March 1921.
Rainfall (number of rainy days in April)	Xj	This index refers to the days wet at Lincoln in April. (Lincoln is in the main wheat producing region.) The figures were obtained from the Meteorology Office of the Department of Air. For the harvest of 1922 the days wet in April, 1921, have been used.
Last year's wheat acreage	Xk	This is the same series as Xa except that the observations have been lagged one year.

<sup>1</sup> See, however, *The Parliamentary Wheat Committee Report*, Wellington, N. Z. 1929, in which a slightly different set of prices are quoted. The computations had already been carried out before the discrepancy was noticed.

<sup>2</sup> The series are given in Table 3.

TABLE 3. THE SYMBOLS AND UNITS ARE AS DESCRIBED IN THE APPENDIX

Variables	Wheat acres	Wheat price	Fat lamb price	Red clover acres	Number of rainy days in April	Wheat acres t-1.
Year	Xa	Xb	Xc	Xi	Xj	Xk
1920	140	326	777	67	9	208
1921	220	362	787	62	12	140
1922	353	362	665	63	7	220
1923	276	278	548	69	7	353
1924	174	230	783	135	13	276
1925	167	266	814	55	5	174
1926	152	338	1000	104	7	167
1927	220	342	740	66	5	152
1928	261	274	700	85	7	220
1929	255	274	800	79	11	261
1930	236	286	780	98	13	255
1931	249	286	660	47	6	236
1932	269	274	380	33	6	249
1933	303	222	400	39	8	269
1934	286	184	380	106	7	303
1935	225	212	600	116	7	286
1936	249	221	580	135	12	225
1937	222	229	680	107	7	249
1938	186	252	720	116	11	222
1939	189	276	640	88	16	186
1940	258	276	580	71	5	189
1941	243	276	700	80	10	258
1942	258	276	670	133	7	243
1943	287	284	700	235	9	258
1944	234	296	710	265	7	287
1945	184	296	710	206	13	234
1946	161	340	750	329	12	184
1947	141	340	790	346	11	161
1948	124	352	830	397	17	141
1949	147	384	1000	214	14	124
1950	125	408	1050	213	13	147
1951	145	494	1160	101	12	125
1952	90	494	2200	187	12	145
1953	127	511	1300	147	13	90

## REPORTS AND MINUTES

### ANNUAL REPORT OF THE PRESIDENT, AFEA

I am most grateful to you for the privilege of serving you as President during the past year. I have enjoyed it. It has been a very fine experience. I have come to know many of you much better than I had known you before. I have learned how hard some of you are willing to work in the interest of the Association. Lowell Hardin, our Secretary-Treasurer, has done an outstanding job. I am sure he has given much more to the Association than would be required of anyone holding this office.

Harold Halcrow and George Brinegar have done an outstanding job with the *Journal*. We are grateful to them, to the Editorial Council and to the University of Connecticut which has supported Mr. Halcrow and Mr. Brinegar. Mr. Halcrow has completed his term as Editor and your Executive Committee has selected Robert Clodius of the University of Wisconsin to replace him. We are grateful to Mr. Clodius and to the University of Wisconsin for assuming the responsibility of editing our *Journal* for the next three years.

I want to thank William Nicholls and the fourteen people who worked with him in handling our Awards Program. They did an excellent job with the program which is now a sizeable task.

Gordon Ball and his Committee on Student Activities have been active during the past year. We have more students participating in our Student Debate and Public Speaking Contest than ever before in our history. We now have some twenty-five to thirty student departmental chapters of the American Farm Economic Association. Our student activities during the past year have been at a very high level.

We have continued to struggle with the idea of developing a satisfactory procedure for honoring outstanding agricultural economists. Joseph Ackerman, Karl Brandt and Harry Trelogan have served as a committee to develop a program which would be satisfactory to the majority of our membership. We believe we have such a program to present to you today.

The Employment Committee, under the direction of Norman Nybrotten, has continued to function in a very fine and efficient manner.

Mr. H. C. M. Case and his Committee for Cooperation with Agricultural Economists Abroad continue to serve us well.

The Agricultural Data Committee, under the leadership of Walter Ebling and Dorris Brown, has worked hard in an effort to encourage the collection of better statistical information for use by research and extension people. The Executive Committee adopted a resolution supporting the collection of data for research and education.

The Finance Committee, under the leadership of R. I. Nowell, has developed a plan whereby sustaining membership may be secured.

The membership drive was handled in a very fine manner by Howard Diesslin and his committee.

We have established a committee to make plans for the celebration of our 50th anniversary. This committee, headed by Lawrence Witt, has made substantial progress in providing us with the history of our association which could become an integral part of our 50th anniversary celebration.

The Directory, started by Karl Brandt, has been completed and a copy



mailed to each member. We are grateful to Joseph Ackerman, the Directory Committee and many others who have worked hard to make it possible. Karl Brandt and his Advertising Committee have worked hard to provide revenue from advertising in the *Journal* and in the Directory.

Mervin Smith and Claude Hummel deserve much credit for the fine way in which they handled the local arrangements for our meeting in Cleveland last winter.

George Abshier and his Local Arrangements Committee here in North Carolina have done an excellent job in handling local arrangements for this meeting.

In appreciation for the excellent cooperation of all the committees and to preserve the committee structure for the Association, I am hereby requesting that a list of committees be printed in the *Journal* as a part of this report.

I feel that the Association is making satisfactory progress and that we are doing a good job of stimulating the professional improvement of our members. However, we are not without problems. Our expenses have been rather heavy in recent years. Also, there is some difference of opinion as to the objectives of the Association. I have been very careful to bring all suggestions and criticisms to the attention of the Executive Committee.

There is some agitation for a full-time executive secretary. This suggestion has received consideration by the Executive Committee. It is my personal opinion that such a move would necessitate doubling our present budget. This would mean that we would need to find considerable revenue from sources in addition to membership fees. I personally favor putting emphasis on the one objective of professional improvement through our summer and winter meetings and through our *Journal* and committee structure and attempting to stay away from the type of function normally assumed and performed by trade associations. Our Association is heavily subsidized by those institutions which support the offices of the President, Secretary-Treasurer and Editor. Our present system should be continued for a while longer as our membership increases. We will eventually have to face the reality of employing a full-time executive secretary; however, I do not believe we are ready for it now.

We have made substantial progress in bringing our Association closer to other professional organizations. We must continue to work in this direction otherwise we may drift away and lose some of the real value of close association with other professional societies.

A committee is to be appointed to develop a plan for working with Resources for the Future on a policy for resource adjustment.

We have made real progress with our student program, including greater participation by graduate students. We can improve on this program, and suggestions have already been made for strengthening it.

Again, I want to thank you for the privilege of serving you as President. It has been a real pleasure and a distinct honor.

H. BROOKS JAMES, *President, AFEA*

## REPORT OF THE SECRETARY-TREASURER, AFEA

1956-57

Association membership experienced a gradual growth with a net increase of 114 members during the year (Table 1). In excess of 300 individuals who were members in 1956, however, did not continue their membership this year.

*Income and Expenses*

Association cash receipts exceeded cash disbursements for the year by \$605.65 (Table 2). The cost of conducting our awards program continues to be financed by grants obtained specifically for this purpose. Thus, while total Association activities including the awards program resulted in a drop of \$5,559.46 in our net worth for the year, the Association's net worth exclusive of special grants funds (valuing securities at cost) dropped \$3,522.13. Approximately \$1,100 of this net worth decrease represented expenditures on the Association's Directory Handbook (Table 2).

*Balance Sheet*

As indicated above when all marketable securities are valued at cost, the net worth of the Association (all activities) decreased \$5,559.46 in 1956-57 (Table 3). If market value of securities were used both at beginning and end of year, the net worth would have shown a decrease of \$8,517.53. When the assets of the Association are divided between general accounts and the accounts of the special grants activities, net worth of the Association exclusive of special grants activities dropped by \$3,522.13 (Table 4). This net worth change is calculated valuing securities at cost.

*Special Grants Fund*

In its special grants funds the Association had a balance of \$7,998.48 at the end of the year (Table 5). The awards program was expanded last year calling for expenditures of \$2,158.55 in awards activities. Interest income of \$247.73 (2% on the beginning balance of \$9,909.30) was assigned to the fund.

All will recognize that the total costs of conducting the affairs of the Association are by no means covered in the above expenditures. The officers and

TABLE 1. NUMBER OF MEMBERS AND SUBSCRIBERS, AMERICAN FARM ECONOMIC ASSOCIATION, JULY 1, 1953-57

Classification	1953	1954	1955	1956	1957	Net Change 1956 to 1957
Regular members	1594	1740	1796	1960	1998	38
Junior members	205	187	149	284	321	37
U. S. libraries and firms	304	307	269	335	320	-15
Foreign libraries and firms	341	355	351	425	472	47
Exchanges	1	1	1	1	8	7
Total	2448	2590	2566	3005	3119	114

TABLE 2.  
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TABLE 2. AMERICAN FARM ECONOMIC ASSOCIATION STATEMENT OF INCOME AND DISBURSEMENTS FOR YEAR ENDING JUNE 30, 1957, WITH COMPARISONS (TOTAL ACTIVITIES OF THE ASSOCIATION INCLUDING SPECIAL GRANTS)

	Actual 1955-56	Actual 1956-57	Budgeted for 1956-57
<i>Income Item</i>			
AFEA dues, subscriptions	\$18,149.59	\$21,245.47 <sup>1</sup>	\$20,000
Sale of back issues, JFE	588.59	1,713.34	500
Sale of reprints, JFE	869.47	1,381.44	800
Advertising	210.00	620.00 <sup>2</sup>	500
Sale of directories (Handbook)	—	—	1,500
Annual meeting	91.68	590.43	—
Awards program	100.00	19.48	—
Interest	372.50	895.63 <sup>3</sup>	275
Dividends	2,744.02	2,813.30 <sup>4</sup>	2,800
Collected for WFEA	549.50	599.00	—
Collected for CAES	257.50	306.50	—
Miscellaneous revenue	—	50.48	—
Capital depletion (sale of blnds)	—	—	9,925
Total	\$23,932.85	\$30,235.07	\$36,300
<i>Expense Item</i>			
Journal printing	\$18,296.85	\$17,437.60	\$20,000
Editing fees, JFE	1,262.00	1,168.00	1,400
Reprints, JFE	1,036.39	2,439.36	1,200
Purchase, back issues, JFE	54.00	307.73	400
Student section awards	51.93	100.00	100
Awards program expense	1,639.44	2,058.55	2,100
Annual meetings expenses	1,773.00	2,277.72	2,000
Postage and telegrams	305.52	656.24	600
Office supplies, expenses	366.53	463.81	500
Subscription refunds, miscellaneous	724.61	475.16	8,000
Directory Handbook	—	1,093.15	—
WFEA dues transmitted to WFEA	455.50	692.50	—
CAES dues transmitted to CAES	225.00	339.50	—
Non-par items	10.90	3.60	—
Interest on borrowed funds	—	116.50	—
Total	\$ 26,201.67	\$29,629.42	\$36,300
NET GAIN	\$-2,268.82	\$ 605.65	—

<sup>1</sup> Regular memberships except for one \$100 sustaining membership.<sup>2</sup> Includes \$170 in advertising revenue for Directory Handbook.<sup>3</sup> \$601.88 earned in 1956-57 plus \$293.75 earned in 1955-56 and collected in 1956-57.<sup>4</sup> Includes \$185.92 realized from sale of rights, AT&T stock.

committee members, their colleagues and their institutions continue to make financial and personal contributions substantially larger than many members envision. Notable in their extra contributions this year have been North Carolina State College and President Brooks James; the Farm Foundation and the work of Joe Ackerman and Howard Diesslin in bringing our Directory Handbook to completion; the University of Connecticut and our Editor Harold Halcrow; and our institution and associates at Purdue University.

Respectfully submitted

LOWELL S. HARDIN  
Secretary-Treasurer

TABLE 3. AMERICAN FARM ECONOMIC ASSOCIATION BALANCE SHEET, JUNE 30, 1956 AND JUNE 30, 1957 (TOTAL ACTIVITIES OF ASSOCIATION INCLUDING SPECIAL GRANTS)

	June 30, 1956	June 30, 1957
<i>Assets</i>		
<i>Current Items</i>		
Cash in bank	\$ 3,579.08	\$ 4,184.73
Interest earned but not collected	293.75	
	\$ 3,872.83	\$ 4,184.73
<i>Investments in U. S. Gov. Obligations</i>		
Series F Savings Bonds, cost plus increment	1,636.00	1,678.00
Treasury bonds at cost (quoted value 6/30/57, \$20,812) <sup>1</sup>	24,045.54	24,045.54
	25,681.54	25,723.54
Marketable securities at cost (quoted value 6/30/57, \$63,250) <sup>2</sup>	33,361.65	33,361.65
Prepaid Journal publication expense	5,831.19	—
Total	\$68,747.21	\$63,269.92
<i>Liabilities and Net Worth</i>		
Liabilities Obligations to WFEA & CAES	126.50	—
Prepaid membership dues	—	82.17
<i>Net Worth</i>		
Net Worth—		
Balance	6/30/55 \$70,680.57	6/30/56 \$68,747.21
Gain or loss for year	—2,059.86	—5,559.46
Total	\$68,747.21	\$63,269.92

<sup>1</sup> Quoted value, same securities, 6/30/56 was \$22,155.<sup>2</sup> Quoted value, same securities, 6/30/56 was \$64,906.

TABLE 4. AMERICAN FARM ECONOMIC ASSOCIATION NET WORTH EXCLUSIVE OF SPECIAL GRANTS FUNDS, JUNE 30, 1956 AND JUNE 30, 1957

	June 30, 1956	June 30, 1957
<i>Assets</i>		
Assets, Table 3	\$68,620.71	\$63,187.75
	\$68,620.71	\$63,187.75
<i>Liabilities</i>		
Balance, special grants funds	9,909.30	7,998.48
Balance, graduate student fund	100.00	100.00
	10,009.30	8,098.48
Net Worth Exclusive of Special Grants	\$58,611.40	\$55,089.27

TABLE 5. TRANSACTIONS AND BALANCE IN SPECIAL GRANTS FUND, 1956-57,  
AMERICAN FARM ECONOMIC ASSOCIATION

	1955-56	1956-57
<i>Beginning Balance and Income</i>		
Balance on hand, first of year	\$11,169.50	\$9,909.30
Interest earned during year	279.24	247.73
Capital contributions received	100.00	—
<b>Total</b>	<b>\$11,854.74</b>	<b>\$10,157.03</b>
<i>Disbursements from fund</i>		
Awards made and direct expense of program	1,639.44	2,158.55
<b>Ending Balance</b>	<b>\$ 9,909.30</b>	<b>\$ 7,998.48</b>

## REPORT OF INVESTMENT COMMITTEE, AFEA

1956-57

On the following pages are reports on marketable securities (stocks and bonds) and on Government securities held by the Association.

Our financial reports are in terms of cost prices. Market values as of June 30, 1956 and 1957 are listed for the stocks and bonds.

*Stocks*

In summary our stock portfolio shows this activity for the year:

	<i>At Cost</i>	<i>Value</i> <i>Quoted</i>
Stocks* on hand June 30, 1956	\$32,389.84	\$63,934.62
Change in securities account during year	0	1,546.24
Value of shares June 30, 1956	\$32,389.84*	\$62,388.38*
Dividends received on stocks during year	2,813.30	
Percent return on stocks valued at cost of	\$33,361.65	8.4%

*Bonds*

	<i>At Cost</i>	<i>Quoted</i>
Bonds on hand June 30, 1956	\$26,653.98	\$24,763.80
Changes in bond account during year	42.00	1,411.83
Value bonds June 30, 1956	\$26,695.98	\$23,351.97
Net interest income on bonds during year	\$ 601.88	

Prepared for Investment Committee by  
L. S. HARDIN, Secretary-Treasurer

\* Excludes Chi. Mil. & St. Paul R. R. security listed on Merchantable Stocks & Bonds record.



**AMERICAN FARM ECONOMIC ASSOCIATION MERCHANTABLE STOCKS AND BONDS RECORD,  
JUNE 30, 1957**

	6-30-56		Additions in Year		Cost	Dividends Rec'd.	Market Value	
	No. Shares	Orig. Cost	No.	Cost No.			6-30-56	6-30-57
Am. Smelting Pfd.	10	\$1,665.30	10	\$1,665.30	\$ 70.00	\$ 1,602.50	\$ 1,367.50	
Am. Tel & Tel	28	4,666.23	28	4,666.23	437.92	5,040.00	4,900.00	
Borden Company	55	2,162.41	55	2,162.41	154.00	3,258.75	3,368.75	
Chase-Manhtn. Bank	38	1,036.01	38	1,036.01	104.00	1,819.25	1,800.25	
C & O RR	40	2,020.92	40	2,020.92	155.00	2,540.00	2,470.00	
Clark Equipment	150	2,200.67	150	2,200.67	337.50	8,962.50	9,750.00	
Commw. Edison	56	1,803.60	56	1,803.60	112.00	2,268.00	2,170.00	
Corn. Prod. Ref.	75	1,891.05	75	1,891.05	108.76	2,212.50	2,268.75	
E. I. DuPont	25	2,403.25	25	2,403.25	162.50	5,275.00	4,837.50	
General Electric	150	1,920.57	150	1,920.57	300.00	9,150.00	10,368.75	
Liggett & Myers	50	2,494.55	50	2,494.55	250.00	3,337.50	3,193.75	
N. Ill. Gas	17	317.05	17	317.05	14.28	312.38	308.13	
Owens Ill. Glass	70	2,925.35	70	2,925.35	175.00	5,162.50	4,331.25	
Sears Roebuck	151	1,845.38	1 — 152	1,845.38	151.25	4,662.12	3,990.00	
Std. Oil, Indiana	100	2,037.40	100	2,037.40	170.10	6,012.50	5,250.00	
Std. Oil, N. J.	9	68.50	1 — 10	68.50	20.90	514.12	663.75	
Swift & Company	40	931.60	40	931.60	90.00	1,805.00	1,350.00	
Chi. Mil. & St. Paul	*	971.81	*	971.81	*	972.00	861.90	
<b>Total</b>		<b>\$33,361.65</b>		<b>\$33,361.65</b>	<b>\$2,813.30</b>	<b>\$64,906.62</b>	<b>\$63,250.28</b>	

\* R. R. Bond, not a stock. \$14.38 received treated as interest income.

**AMERICAN FARM ECONOMIC ASSOCIATION, GOVERNMENT SECURITIES, JUNE 30, 1957**

		Cost 6-30-56	Balance 6-30-57	Int. Rec'd.	Maturity	
					Value	Date
US Treasury	128966F	\$5,153.39	\$5,153.39	\$125.00	\$5,000	12-15-37/72
	128967H	5,153.39	5,153.39	125.00	5,000	12-15-67/72
	128968J	5,153.39	5,153.39	125.00	5,000	12-15-67/72
	583153C	1,028.84	1,028.84	25.00	1,000	12-15-67/72
	583154D	1,028.84	1,028.84	25.00	1,000	12-15-67/72
	583155E	1,028.84	1,028.84	25.00	1,000	12-15-67/72
	583156F	1,028.84	1,028.84	25.00	1,000	12-15-67/72
	452801A	993.75	993.75	25.00	1,000	6-15-67/72
	414789K	993.75	993.75	25.00	1,000	6-15-67/72
	414790L	993.13	993.13	25.00	1,000	6-15-67/72
	414791L	993.13	993.13	25.00	1,000	6-15-67/72
	58025E	496.88	496.88	12.50	500	6-15-67/72
US Savings	M1663199F	818.00	839.00		1,000	5-11-62
	M166320F	818.00	839.00		1,000	5-11-62
<b>Total</b>		<b>\$25,682.17</b>	<b>\$25,724.17</b>	<b>\$587.50*</b>		
<b>Increase in 2 Series F Bonds</b>				<b>42.00</b>		
<b>Total</b>		<b>\$25,682.17</b>	<b>\$25,724.17</b>	<b>\$629.50</b>		

\* To \$587.50 add \$14.38 for R. R. bond interest from footnote previous table for total of \$601.88 interest income.

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## REPORT OF THE AUDITING COMMITTEE, AFEA

Upon request of the officers of the Association, we have examined the accounts and statements prepared by the Secretary-Treasurer, Lowell S. Hardin, for the period July 1, 1956 to June 30, 1957.

We have verified both the income statement against the gross totals shown in the receipts journal and the disbursement statement against the gross totals in the disbursement journal. We have also verified the individual disbursements appearing in the journal against the check-book record. The June 30, 1957 bank statement of cash-on-hand corresponds with the total reported on the balance sheet. We have checked the securities record and it agrees with the actual inventory of securities on hand.

The Treasurer's report of financial position accurately reflects his records of transactions and financial position of the Association for the period. In addition, the records and books were being kept in a very neat and understandable manner.

R. L. KOHLS  
J. C. SNYDER

REPORT OF THE EDITOR,  
*JOURNAL OF FARM ECONOMICS*

During recent years the *Journal of Farm Economics* has increased in size as follows: 1953—1,050 pages; 1954—1,320 pages; 1955—1,530 pages, and 1956—1,870 pages.

A major part of this growth resulted from increasing the size of the Proceedings Issue and from expanding the joint meetings with the AEA which are published in the May issue. The regular issues of the *Journal* have been maintained generally at about 192 pages per issue.

During 1956—57 the ratio of manuscripts accepted to those submitted has held about steady. Approximately one-third of the manuscripts submitted to the Editor for publication have not been published. A substantial number of those published have been shortened or revised as a result of review by the editorial staff.

The Editor wishes to express his considerable appreciation to all those who have cooperated in publication of the *Journal of Farm Economics*. George Brinegar, as Associate Editor, and Robert L. Clodius, as Book Review Editor, have contributed extensively to the work of the Editor's office.

The members of the Editorial Council have faithfully reviewed a large number of manuscripts. Each manuscript in each of the regular four issues of the *Journal* is generally reviewed by at least two people in addition to the Editor.

In addition to the help of the Editorial Council several members of the Association have contributed their time in review of manuscripts. Those who have contributed in this manner are: Holbrook Working, Food Research Institute, Stanford University; J. N. Boles and R. G. Bressler, University of California; Harold F. Breimyer and Louis F. Herrmann, Marketing Research Division, Agricultural Marketing Service, Washington, D.C.; George Abshier, North

Carolina State College; Kenneth L. Bachman, William E. Hendrix, Warren R. Bailey, Orlin J. Scoville, Melvin L. Upchurch, C. W. Crickman, Ronald L. Mighell, Burton L. French, Glen T. Barton and Fred A. Clarenbach, Farm Economics Research Division, Agricultural Research Service; Harlan Lampe, Irving Fellows and Stewart Johnson, University of Connecticut.

## CONSTITUTION OF THE AMERICAN FARM ECONOMIC ASSOCIATION\*

### ARTICLE I

*Name.* The name of the Association shall be The American Farm Economic Association.

### ARTICLE II

*Object.* The objective of this Association is to further the development of systematic knowledge of agricultural economics for the purpose of improving agricultur and agriculture's contribution to the general economy. As a professional organization, the Association will pursue this objective by facilitating scientific research, instruction, publications, meetings, and other activities designed to advance and disseminate knowledge in agricultural economics.

### ARTICLE III

*Membership.* The membership shall consist of persons having a professional interest in agricultural economics.

The Executive Committee may enter into arrangements for joint memberships with other regional and national associations interested primarily in promoting agricultural economics.

The Executive Committee may prescribe conditions for student, corresponding, sustaining, or other memberships.

### ARTICLE IV

*Organization.* The officers shall be a President, a President-Elect, and two Vice-Presidents, who shall be elected for one year, and who shall serve until their successors shall qualify; and a Secretary-Treasurer, who shall be appointed by the Executive Committee. In case of incapacity of the President to act, the Vice-President receiving the highest number of votes shall act as President. The President-Elect shall be a member of the Executive Committee in full standing and automatically become President the year following his election as President-Elect.

The Executive Committee shall consist of the active officers, including the President-Elect, the two immediately preceding past Presidents, and Secretary-Treasurer; and will include the President of any national or regional association with which The American Farm Economic Association has entered into joint membership arrangements, who will serve in an ex-officio and non-voting capacity. It shall appoint the Editor of the *Journal of Farm Economics*. It may adopt rules and regulations for the conduct of its business not inconsistent with the constitution of the Association, or with rules adopted at the annual meeting. It shall act as a committee on time and place of meetings, and perform such other duties as the Association shall delegate to it.

\* As amended and adopted at the Annual Meeting of the Association, August 30, 1957.

There shall be a standing committee on investment policy with respect to Association funds. The Secretary-Treasurer shall be a member of this committee. He shall have authority to acquire, sell, and transfer property for the Association. The actions of this committee shall be subject at all times to review by the Executive Committee.

Special committees may be appointed in accordance with the needs of the Association. Special committees and the investment committee shall be appointed by the President with the approval of the Executive Committee.

The President shall have responsibility for preparing a program for the annual meeting.

#### ARTICLE V

*Election of Officers.* Officers elected shall be a President-Elect, and two Vice-Presidents. In case of death or incapacity of the President-Elect of the preceding year, a President also shall be elected for the forthcoming year. The President and the two immediately preceding past Presidents shall constitute a nominating committee. The President shall act as chairman of the committee.

Two nominations shall be made for each single office. Four nominations for Vice-President shall be made. No person who has served a term as President shall thereafter be eligible for that office.

Not later than 40 days before the annual meeting of each year, the Secretary-Treasurer shall mail a ballot to each member of the Association who has paid dues for the current year, not including corporations, libraries, or other institutions. Said ballot shall provide for a vote for each elective officer. For each office the ballot shall contain one blank line. A brief biographical sketch of each nominee shall be included.

The ballot shall be enclosed in an envelope which shall be marked on the outside as follows:

"Ballot for Officers of the American Farm Economic Association. This ballot shall reach the Secretary-Treasurer not later than ten days before the first day of the annual meeting.

"Name \_\_\_\_\_. Your name is required for checking with the list of members. Ballots will be opened by the tellers in such a manner as to preserve the secrecy of the ballot."

The sealed ballots shall be opened by tellers, appointed by the President, and they shall report at the annual business meeting. The persons receiving a majority of votes for the offices of President-Elect and President (when the office is to be filled) shall be declared elected. The two candidates receiving the highest number of votes for the offices of Vice-President shall be declared elected.

If no one has received a majority of the votes cast for the offices of President-Elect, and President, the position shall be filled by ballot at the annual business meeting from the two receiving the largest number of votes for the office. A tie for the office of Vice-President shall be resolved by ballot at the annual business meeting.

#### ARTICLE VI

*Fellows.* In recognition of distinguished contributions to agricultural economics the title "Fellow of The American Farm Economic Association" may be conferred upon individuals elected according to procedure determined by the membership at the annual business meeting.

## ARTICLE VII

*Dues.* Changes in dues for various types of membership in the Association shall be subject to determination by the membership at the annual business meeting, except that the rate for corresponding memberships shall be determined by the Secretary-Treasurer in negotiation with the sponsoring agencies. All dues shall be payable in advance.

## ARTICLE VIII

*Meeting.* There shall be held an annual meeting of the Association, and such other meetings as the Executive Committee may determine. Notice of meetings shall be mailed to each member at least four weeks in advance.

## ARTICLE IX

*Amendments.* This constitution may be amended by a two-thirds vote of the members present at any business meeting of the Association.

**PROGRAM OF AMERICAN FARM ECONOMIC ASSOCIATION  
FOR RECOGNIZING OUTSTANDING AGRICULTURAL  
ECONOMISTS THROUGH DESIGNATION OF  
FELLOWS**

1. *Title.* "Fellow of the American Farm Economic Association."
2. *Criteria for Selecting Fellows.* The main consideration shall be continuous contribution to the advancement of agricultural economics. Achievements may be in the fields of research, teaching, extension, administration, or business, and may also include authorship.
3. *Nomination.* Any member of the AFEA may nominate any living person for the honor of election as a Fellow by submitting his name to the Secretary of the Association prior to December 15 preceding the election. Any member making nominations should be prepared, upon request, to submit biographical information in support of the nominee.
4. *Selection of Candidates.* The Executive Committee of the Association shall select candidates from the nominees and present the list of candidates (approximately twice the number to be elected) to the Fellows Election Committee of the Association together with supporting biographical data for each.
5. *Election.* A Fellows Election Committee composed of five Fellows shall be appointed by the Executive Committee of the AFEA, and one member shall be designated chairman for the first year. The membership of the Fellows Election Committee shall rotate with one member being replaced each year. The senior member (in years of service) shall serve as chairman of the Committee.  
The Fellows Election Committee shall elect the Fellows, not to exceed three in any one year, from the candidates submitted by the Executive Committee of the Association.
6. *Reporting Election.* The chairman of the Fellows Election Committee shall report to the Secretary of the Association at least 60 days before the annual meeting the names of the newly elected Fellows.  
The Fellows Election Committee may also submit the names of two alter-

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nates, in the order they are to be accepted in the event contingencies prevent conferring of the honor on any of the Fellows elected.

7. *Announcement of Election.* The names of the newly elected Fellows shall be announced at the annual meeting of the AFEA by the chairman of the Fellows Election Committee or his appointed representative, who will read a statement regarding the achievements of each Fellow and will present a certificate of recognition to the person so honored. The statement regarding achievements shall be published in the Proceedings issue of the *Journal of Farm Economics*.

## REPORT OF THE CHAIRMAN, AWARDS COMMITTEE, AFEA

This is the second year during which all of the varied awards activities of the Association have been conducted under a single overall Awards Committee. As Chairman of this committee, it has been my responsibility to coordinate the activities of the several subcommittees and to serve in a general administrative capacity. Except for myself, all other members of the Awards Committee were also members of four special subcommittees, each of whose chairman and members were also appointed directly by President James. It was these four subcommittees—on Published Research Reports, on Doctoral Theses, on Graduate Student Papers, and on Best *Journal of Farm Economics* Article—which developed their own standards for weighing the merits of works within their respective jurisdictions, reached a consensus on these works which most merited awards, and then notified me of their findings.

The chairmen and members of these four subcommittees not only performed their difficult assignments conscientiously and diligently but without exception met their deadlines, greatly facilitating the fulfilment of my own responsibilities in preparing for the awards ceremony at Lake Junaluska. My own contributions were even fewer this year than last, being largely limited to administering the printing and distribution of the announcements and the preparation for presentation of the award certificates. Hence, the remainder of this report is based upon the reports to me of the chairmen of the several subcommittees.

### 1. Awards for Published Research Reports

#### Rules

According to the announcements distributed in January, 1957, the rules for submitting published research were set forth as follows:

1. Three \$250 awards, each in a different field of agricultural economics, will be made for publications including bulletins, articles, and pamphlets (books are ineligible) classified in the following categories:

- (a) Farm management and production economics
- (b) Agricultural marketing
- (c) Agricultural prices
- (d) Agricultural finance
- (e) Land and water economics and conservation
- (f) Theory and methodology
- (g) Agricultural policy
- (h) General agricultural economics

2. Persons submitting items should indicate the field in which they believe the reports should be classified.

3. Selections will be made from published research bearing the publication date of 1956.

4. Eligible recipients must be less than 41 years of age at the time of publication.

5. Members of the Awards Subcommittee for Published Reports will not be eligible to submit papers of their own.

6. Each published report may receive only one award presented by the American Farm Economic Association in 1957. An entry may, however, be considered as eligible for more than one of the following types of awards: (a) best article appearing in the *Journal of Farm Economics* (b) published reports; and (c) Ph.D. theses.

7. Nine copies are requested of each publication submitted for consideration. Fewer copies will be accepted in such cases as articles appearing in national journals available to the judges. In no event should less than three copies be sent.

8. The Awards Subcommittee for Published Reports will consist of nine persons, in addition to the Chairman, representing the various designated fields. The members of the Subcommittee, all of whom will serve as judges, are:

George E. Brandow, Pennsylvania State University  
 Max E. Brunk, Cornell University  
 Marion Clawson, Resources for the Future, Inc.  
 Earl O. Heady, Iowa State College  
 W. E. Hendrix, U.S. Department of Agriculture  
 Sidney S. Hoos, University of California  
 Herman M. Southworth, U.S. Department of Agriculture  
 Lawrence W. Witt, Michigan State University  
 Elmer J. Working, Washington State College

9. Publications should be sent directly to the Chairman of this Subcommittee, James P. Cavin, Statistical and Historical Research Branch, Agricultural Marketing Service, Washington 25, D.C., on or before March 15, 1957. (For a month or more, while Chairman Cavin was incapacitated by illness, Herman Southworth served well as Acting Chairman of this Subcommittee).

#### *Procedures*

Forty-four published research reports were received and classified by subject matter as indicated by the authors. Each of the judges received all reports in the subject-matter field for which he was responsible and recommended those which he considered qualified for the final judging. For this purpose, each judge received from the subcommittee chairman a standard score-sheet and a reporting form. Twelve reports were nominated for the final judging, in which all members of the subcommittee participated. While the number of entries this year was 10 per cent greater than a year ago, the judges reported that the general level, in terms of quality, was not quite as high as in other recent years. As a result, the several judges' rankings showed somewhat wider variability than a year ago.

#### *Recommendations for Awards*

On July 16, 1957, Chairman James P. Cavin officially notified me of the following results (in alphabetical order) of the deliberations of the Subcommittee on Published Research Reports:

*For Awards of \$250 each:*

To D. A. CLARKE, JR. of the Giannini Foundation of Agricultural Economics, University of California, for his bulletin, *Milk Delivery Costs and Volume Pricing Procedures in California*, California Agricultural Experiment Station, Bulletin No. 757 (December 1956). (Submitted in the field of Agricultural Marketing.)

To KARL A. FOX of Iowa State College, for his article, "The Contribution of Farm Price Support Programs to General Economic Stability," published in *Policies to Combat Depression*, a report of the National Bureau of Economic Research, Princeton, 1956, pp. 295-349. (Submitted in the field of Agricultural Policy.)

To B. C. FRENCH of Michigan State University, for his bulletin, *The Long-Term Price and Production Outlook for Apples in the United States and Michigan*, Michigan State University, Agricultural Experiment Station Technical Bulletin 255 (April 1956). (Submitted in the field of Agricultural Prices.)

*For Honorable Mention:*

To VERNON W. RUTTAN of Purdue University, for his article, "The Contribution of Technological Progress to Farm Output: 1950-75," published in *The Review of Economics and Statistics*, Vol. 38 (February 1956), pp. 61-69. (Submitted in the field of General Agricultural Economics.)

*Recommendations for Future Procedure*

Upon the basis of the experience of this subcommittee, Chairman Cavin has made three recommendations which should receive attention in the future:

(1) The subject-matter breakdown should be improved.

(a) This is particularly true with respect to Agricultural Marketing, in which the largest number of reports was submitted. More specifically, should more adequate provision be made for recognizing outstanding contributions in such subfields as physical efficiency and merchandising; and, if so, how might such contributions best be judged since (because they lie largely outside of the usual scope of economics) agricultural economists are not especially qualified to weigh their merits? This recommendation, made a year ago, is repeated again in view of the important fact that, of the 44 entries, 18 were in the field of Agricultural Marketing.

(b) This year a number of entries might most properly have been classified in the field of farm labor and population. Lacking such a category, the Subcommittee admitted them as part of the field of General Agricultural Economics. Chairman Cavin recommends that one of the following alternatives be adopted: (1) Establishment of a separate field for Farm Population, Farm Labor, and Rural Welfare; (2) Exclusion of such contributions as outside the field of agricultural economics; and (3) Continuation of the present practice of including them under General Agricultural Economics. I would personally oppose the second alternative and would recommend the third alternative since the total number of entries in this field even so was only eight.

(2) After further experience with the old system of a handicap of a 5-point deduction for each eligible author and 10 points for each ineligible author) beyond one, Chairman Cavin recommends (subject to the discretion of the subcommittee chairman each year) a deduction of 5 points for the second eligible author and a deduction of no more than 2 points for additional authors regardless of number. His reason is that any larger deduction tends to eliminate mul-

multiple-author contributions from an award almost automatically regardless of relative quality.

(3) Chairman Cavin also recommends consideration of the question as to whether a distinction should be made between (a) published reports of the bulletin type, which are typically based on a large amount of empirical research, and (b) other contributions, such as journal articles, which typically deal with general ideas or summarize the results of earlier research. In any case, I would like to recommend in this connection that the present provision making books ineligible be rescinded, at least for monographs and other books not primarily written for textbook use.

## 2. Awards for Doctoral Theses

### Rules

According to the announcements distributed in January, 1957, the rules for submitting doctoral theses were set forth as follows:

1. Three \$250 awards will be made for theses prepared by candidates for the Ph.D. degree in any department of economics or agricultural economics.

2. An entry must be submitted by the head of the department to which the thesis was presented in partial fulfillment of requirements for a degree. No department may submit more than one thesis for consideration.

3. Selections will be made from those presented to a graduate school faculty during the calendar year 1956.

4. A published thesis may be entered in both the published report and thesis classes but will be eligible for only one award.

5. Only one copy of an unpublished thesis will need to be sent to the committee chairman for consideration. If 2 or 3 are available it will expedite the judging. All copies will be returned after they have been read by the judges.

6. The Awards Subcommittee for Theses will consist of three persons, in addition to the Chairman. These three persons, all of whom will serve as judges, are:

Kenneth L. Bachman, U.S. Department of Agriculture

George G. Judge, Oklahoma A. & M. College

Walter W. Wilcox, Library of Congress\*

7. Theses should be sent directly to the Chairman of this Subcommittee, Ronald L. Mighell, Production Economics Research Branch, Agricultural Research Service, Washington 25, D.C., on or before March 15, 1957.

### Procedures

Fourteen institutions (an increase of two over a year ago) submitted entries to the subcommittee on Ph.D. theses. The fourteen theses were examined by all three judges and their appraisals were consolidated into a final rating under the supervision of Chairman Ronald L. Mighell, who did not himself participate in the judging. Chairman Mighell reports that the general level of accomplishment represented was high.

### Recommendations for Awards

On June 17, 1957, Chairman Mighell officially notified me of the following

\* Dr. Wilcox was appointed to replace Geoffrey S. Shepherd, whose trip to Burma forced him to withdraw after the printed announcement was distributed.

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recommendations (in inverse alphabetical order) of the Subcommittee on Ph.D. Theses:

*For Awards of \$250 each:*

To MARC NERLOVE, for his dissertation, *Estimates of the Elasticities of Supply of Corn, Cotton, and Wheat*, Johns Hopkins University, 1956.

To HOMER C. EVANS, for his dissertation, *The Nature of Competition Among Apple Processors in the Appalachian Area*, University of Minnesota, 1956.

To JAMES THOMAS BONNEN, for his dissertation, *United States Agricultural Capacity: A General Equilibrium Model for 1965*, Harvard University, 1956.

*For Honorable Mention:*

To JOHN ALVIN SCHNITTKER, for his dissertation, *Application of Input-Output Analysis to a Regional Model Stressing Agriculture*, Iowa State College, 1956.

To YAIR MUNDLAK, for his dissertation, *Analysis of Agricultural Production Forecasts in the Statistical Decision Theory Framework*, University of California, Berkeley, 1956.

To ALBERT NELSON HALTER, for his dissertation, *Measuring Utility of Wealth Among Farm Managers*, Michigan State University, 1956.

*Recommendations for Future Procedure*

While Chairman Mighell made no recommendations for the future, the aforementioned awards illustrate a difficulty as to the number of honorable mention awards which should be made in each class of awards. It will be noted that, in the category of published research reports with 44 entries, only one honorable mention was made by the subcommittee, while here three of the fourteen theses received an honorable mention. In the published research category, the judges' scoring would have required the addition of three more names (because of a near tie) if more than one honorable mention had been granted. On the other hand, in the Ph.D. theses category, Chairman Mighell writes that the three theses receiving honorable mention "were not far behind in ranking and [were] close to one another. . . ." In view of the difficulties of knowing where to draw the line between "honorable" and "no" mention, I have simply followed the subcommittee recommendations. However, in the interest of protecting the prestige of the several awards, perhaps some rule should be adopted on the extent to which honorable mentions should be allowed.

**3. Awards for Graduate Students' Contributed Papers**

*Rules*

According to the announcements distributed in January, 1957, the rules for submitting graduate students' contributed papers were as follows:

1. Three awards will be made for papers submitted by graduate students of any department in the United States engaged in training agricultural economists at the graduate level.

2. Each award shall consist of the cash equivalent of a round-trip bus fare from the student's graduate institution to the 1957 Annual Meetings at Lake Junaluska, North Carolina; a \$25 subsistence allotment; and 100 free reprints of the paper as published in the Proceedings Number of the *Journal of Farm Economics*.



3. The student shall be free to choose the subject for his paper, which must, however, be in the area of agricultural economics and shall be limited to 20 minutes' reading time or 9-10 pages of double-spaced typed manuscript.

4. Each department may submit only one paper, selected by a committee of that department. Papers with joint authors are not acceptable.

5. Department heads shall decide which persons qualify as "graduate students." However, full-time staff members working on a degree at their home institutions shall not be eligible.

6. Each department head shall notify Chairman Gordon Ball of Iowa State College by March 15, 1957, if his department expects to submit a graduate student's paper.

7. The winners of the three awards will be notified by June 15, and will be expected to read their papers at the annual meetings at Lake Junaluska. Their papers will be published as part of the proceedings of the 1957 annual meetings.

8. The Awards Subcommittee for Graduate Students' Contributed Papers will consist of four persons, in addition to the Chairman, all of whom will serve as judges:

R. J. Hildreth, Texas A. & M. College  
William O. Jones, Stanford University  
Frank Miller, University of Missouri  
W. H. Pierce, North Carolina State College

9. Five typed copies of each paper shall be sent directly by departments to the Chairman of this Subcommittee, Gordon Ball, Department of Economics and Sociology, Iowa State College, Ames, Iowa, on or before May 15, 1957.

#### *Procedures*

Eleven institutions submitted papers on behalf of a graduate student. The eleven papers were judged by all four members of the Subcommittee on Graduate Students' Contributed Papers.

#### *Recommendations for Awards*

On July 17, 1957, Chairman Ball officially notified me that his Subcommittee recommended (in alphabetical order) the following awards:

To ALAN R. BIRD of Michigan State University, for his contributed paper, "The Effect of Agricultural Price Supports on the Balance of Payments in the United Kingdom."

To WILFRED CANDLER of Iowa State College, for his contributed paper, "An Aggregate Supply Function for New Zealand Wheat."

To CHAIM MENDELSON of the University of California, Berkeley, for his contributed paper, "Approaches to International Trade under Non-Pure Competition."

#### *4. Award for Best Article in Journal of Farm Economics*

As has been the practice for a number of years, the editors and Editorial Council of the *Journal of Farm Economics* annually choose the most outstanding article published in that *Journal* during the preceding year for an award, now valued at \$250. On July 16, 1957, I was officially notified by Harold G. Halcrow, Editor of the *Journal*, that this year's award-winner was:

MARC NERLOVE, for his *Journal* article, "Estimates of the Elasticities of Supply of Selected Agricultural Commodities," Vol. 38 (May, 1956), pp. 496-509.

Thus, the editors confirmed the judgment of the Ph.D. Theses Subcommittee as to the high quality of Mr. Nerlove's work on supply elasticities. However, in view of our rule against more than one award for essentially the same research product, we are making this *Journal* article award to Mr. Nerlove without honorarium.

In view of this fact, the editors have recommended that the \$250 award be divided equally between the two runners-up, who finished in a tie:

To FREDERICK V. WAUGH, for his *Journal* article, "A Partial Indifference Surface for Beef and Pork," Vol. 38 (February, 1956), pp. 102-112.

To THEODORE W. SCHULTZ, for his *Journal* article, "Reflections on Agricultural Production, Output, and Supply," Vol. 38 (August, 1956), pp. 748-62.

Respectfully submitted,

WILLIAM H. NICHOLLS, *Chairman*  
*Awards Committee*

## REPORT OF THE AGRICULTURAL DATA COMMITTEE, AFEA

The Agricultural Data Committee of the AFEA offers the following annual report:

1. Meetings of the committee for the past year include the following:
  - a. August 28, 1956 at Asilomar, California
  - b. November 28, 1956 at the Outlook Conference in Washington, D.C.
  - c. December 29, 1956 at the joint session of the AFEA and the American Economic Ass'n., Cleveland, Ohio
  - d. August 30, 1957 at Junaluska, North Carolina

The Secretary and Chairman of the committee also attended a Federal Statistics Users Conference in Washington on November 15, 1956. The Chairman also attended several other conferences including the Land Grant College meeting in Washington in November where there was a meeting with a joint committee of ECOP and ESCOP on agricultural data, and also two Census committee meetings, one on the Census of Population in October of 1956 and one on the Census of Agriculture in July of 1957.

2. Two subcommittees have continued their work during the past year. They are:

- a. A Subcommittee on Agricultural data needs in Extension—Dr. Dorris D. Brown, Chairman
- b. A subcommittee on agricultural data requirements in outlook and marketing, Prof. J. Carroll Bottum, Chairman

The subcommittee of which Dr. Brown is Chairman obtained recommendations and suggestions on agricultural data needs from nearly all states and territories. These were used in the preparation of the report which the committee made to the Department of Agriculture and the Census Bureau. Appendix II of that report is largely based on the work of this subcommittee. The committee headed by Professor Bottum also made a report during the

past year which was the basis for much of Appendix III in the report of the data committee to the Department of Agriculture and the Census Bureau. During the year the Agricultural Estimates Division of the Agricultural Marketing Service included substantial items in its Budget asking to provide the following:

- a. A structure for providing improved county, state and national data.
- b. Expanded agricultural price statistics
- c. Speedier release and distribution of reports
- d. Additional data and services needed.

However the climate during the past year was unfavorable for obtaining the needed financial support. It is expected that funds for much of the same work will again be requested in the Department of Agriculture Budget for next year. During the coming year the committee expects to devote further time to the data program under consideration in the Department of Agriculture and also to problems of the Agricultural Census of 1960. Some of the suggestions for data improvement already assembled by the committee will be presented to the advisory committee of the Census of Agriculture. It is expected that the questionnaire for that Census will be completed early in 1958 for pretesting in the fall of that year. The new Census of Agriculture is likely to be of special importance to various new programs now being developed in the states. The committee will be glad to consider suggestions from anyone regarding the census, but such suggestions should be made in writing. A panel of papers in agricultural data has been presented at one of the sessions at this meeting. It is expected that another will be organized for the Association's annual meeting a year from now. The committee has had excellent cooperation from various groups and persons. We are especially grateful to Dr. Joseph Ackerman of the Farm Foundation who has served as a Consultant of the committee and offered to pay expenses of some members to meetings who did not have other resources for that purpose.

While the committee has had an active year, much of the work is unfinished especially that dealing with the Census of 1960 and it is recommended that the committee be continued for the next year.

#### *Committee Members*

GEORGE AULL  
FRANK V. BECK  
GEORGE T. BLANCH  
J. C. BOTTUM  
DORRIS D. BROWN  
GEORGE MONTGOMERY  
EMERY C. WILCOX  
WALTER H. EBLING

#### *Consultants*

JOSEPH ACKERMAN  
J. D. BLACK  
RAY HURLEY  
O. V. WELLS

### REPORT OF COMMITTEE ON THE COMMEMORATION OF THE 50TH ANNIVERSARY, AFEA

The committee makes the following recommendation to the Executive Committee, President-Elect and President-to-be-elected.

1. Sections of the American Economic Association in the 1890's and in 1907 and 1908 represent informal precursors of the AFEA. The same may be said

of an informal group meeting at Cornell in 1908 as part of the USDA-Land Grant Colleges summer school of that year.

However, the appropriate founding date is July 28, 1910, the time of a meeting held at Iowa State College which established the American Farm Management Association.

2. Normally a fiftieth anniversary is the completion of the fiftieth year, in this case July 28, 1960 but the practice is by no means clear cut. However, with the 1959 meetings at Cornell and in recognition of the heavy contribution of George Warren and Cornell University to the Association it is recommended that we operate in terms of the fiftieth year. We cannot say "Fiftieth meeting" or "Fiftieth annual meeting" because of gaps during both World Wars and the doubled meetings during the last ten years.

It is recommended that the Association adopt the term "1959-60 Our Fiftieth Year" as the theme and basis for the anniversary. This would be inscribed on the stationery and 1959 program, thus implicitly welcoming a certain amount of summing up of the contributions and mistakes of the past half century.

3. The Association of Agricultural Economists functioning from 1915 to about 1918 was abandoned with the change in the name of the American Farm Management Association to the American Farm Economic Association. Moreover all or nearly all of the 1910 founding members are now dead.

It is recommended that a search be made of the early records of the American Farm Economic Association for a list of members in 1919 and 1920. Possibly Frank Peck can help discover such a list. If such a list can be found it should be consolidated with the names listed from 1910 to 1919 as members of the American Farm Management Association. (Both the Purdue and Cornell University libraries are reported to have a complete file.) This consolidated list shall be considered as the charter members of the AFEA. They should be recognized by means of a suitably designed scroll presented at the first general session of the 1959 annual meetings at Cornell University. (This recommendation is subject to modification when the surviving members of this list are known.)

4. It appears that some historical review should be made of the association in its environment. It may also be appropriate to encourage a certain amount of review and appraisal of the past half century of work in agricultural economics. The following recommendations are made.

- (a) A member of the association shall be charged with preparing a paper on "Background Developments of the American Farm Economic Association." This would deal with the 1890-1920 developments of the association with emphasis on the economic changes and educational environments which nourished the organization of meetings, associations, and the development of the profession.
- (b) Another member of the association should be charged with a paper on "The Work of the American Farm Economic Association." This should be a more common sketch of the association's activities 1920-1959, including such items as officers, nature of programs, and cooperation with other institutions such as the USDA, Bureau of the Census and especially the Social Science Research Council and its grants-in-aid during the late 1920's.
- (c) The editor and president-elect should consider whether the pages of the *Journal* and/or annual meetings of 1959 and 1960 should include additional papers reviewing a half century of work in various sub-areas of agricultural economics. No specific recommendations are made by this committee. It is believed that the previous recommendations constitute

an adequate recognition of our fiftieth year. Any further efforts should be justified on their own merits.

5. It would be appropriate to recognize the date July 28, 1960 as the Fiftieth Anniversary at Iowa State College. If it were to be convenient to have the 1960 meeting at Iowa State it might be possible to follow the above recommendations for presentation at the 1959 meetings at Cornell with a simple opening ceremony and the papers listed under 4a and 4b. Then the 1960 meetings at Iowa State might have several sessions devoted to the sort of papers designated under 4c to serve as a closing program for the Fiftieth Year.

Since the presidential candidates who will develop the 1960 program are not even designated, it appears that this suggestion cannot be made final until late in 1958.

August 26, 1957

Respectfully submitted

O. C. STINE  
STANLEY WARREN  
LAWRENCE WITT, *Chairman*

### REPORT OF THE ELECTION TELLERS

The Teller's Committee counted the ballots on August 30, 1957 with the following results:

President-Elect .....	Raymond G. Bressler
Vice-President .....	Raymond J. Penn
	George E. Brandow
Secretary-Treasurer .....	Lowell S. Hardin
	Respectfully submitted,
	TYRUS R. TIMM, <i>Chairman</i>
	<i>Teller's Committee</i>

### REPORT OF THE RESOLUTIONS COMMITTEE, AFEA

The American Farm Economic Association, meeting at Lake Junaluska on August 30, 1957, wishes to express its appreciation:

- (1) To President James, the officers and the committees of our Association for their arrangements for the excellent program of this meeting and for their efficient conduct of the business of the Association during the year.
- (2) To the staff of North Carolina State College for an unsurpassed demonstration of the meaning of southern hospitality.
- (3) To the staff of the Lake Junaluska Assembly for their most efficient and friendly handling of our large and varied group.

Be is resolved therefore that these expressions of appreciation be placed in the minutes of this meeting and that they be transmitted to the above individuals and groups by the Secretary of the Association.

Respectfully submitted,  
R. G. BRESSLER  
H. R. STUCKY  
J. C. BOTTUM, *Chairman*



EFFECTIVE COOPERATION WITH AGRICULTURAL  
ECONOMISTS ABROAD, AFEA

The committee on "Effective Cooperation with Agricultural Economists Abroad" regards this statement as a continuation of the 1956 report, prepared under the same title, but with some change in committee personnel. In addition the committee wishes to call attention to the papers presented at the winter meeting of the American Farm Economic Association dealing with training foreign students in agricultural economics. These are published in the May 1957, issue of the *Journal of Farm Economics*.

The committee believes that United States agricultural economics staff members should, from a long-time point of view, have a better understanding of two basic needs of foreign students and addresses its major comments to these needs as follows:

1. the preparation foreign students have had for graduate study in the United States; and
2. the graduate training these students should receive to meet the responsibilities of the agricultural economics positions they probably will assume when they return to their home countries.

In many foreign institutions instruction in general economics as well as agricultural economics at the undergraduate level, may be comparable to that of many agricultural colleges in the United States. In other instances, because of the organization of the system of education, foreign graduates in agriculture may have had no preparation in general economics and little or no instruction in agricultural economics. A part of this report is based upon conferences with agricultural economics staff members in a number of Latin American countries. Institutions within any country as in the United States, of course, vary widely in their educational requirements. An analysis of the situation in Latin America, as is true in many other parts of the world, will show that many agricultural colleges are not associated with universities, and there is no opportunity for undergraduate students to secure any economic training except that offered in the agricultural college. While some such institutions may offer some good general economic instruction this is not as likely to be true as when they are associated with a university. In a few foreign agricultural colleges there are no courses offered in farm management, marketing, rural sociology or other subjects pertaining to the field of agricultural economics, although this situation is rapidly changing.

Obviously, many of the agricultural economics departments in the United States have accepted graduates from foreign educational institutions without fully realizing the limitations in their economic training. These students frequently experience difficulty in their graduate work because of lack of adequate preparation. This situation has been verified by discussions with educational leaders from various foreign countries.

Naturally, students seeking to register for advanced work will not like to emphasize their own deficiencies in training. In fact, in many instances they do not fully realize their shortcomings until they are registered in courses that prove too difficult for them. There is good reason, therefore, to emphasize one of the points set forth in the report of this committee presented to the AFEA in 1956. This pertains especially to the task of helping the students make proper educational adjustments before entering upon full-time graduate study. A point

to be recognized, which was found to be especially true of Latin American graduate students, is that many students are likely to enter commercial positions after taking training in agricultural economics, and will have special need for training in general economics, international trade and transportation as well as other economic training lying outside of the usually recognized field of agricultural economics. Students trained for positions in agricultural economics need the same broad training. More frequently than in the United States they are called upon to advise on general economic problems.

The inadequate training of many students coming to the United States from Latin America has been recognized by the Inter-American Institute of Agricultural Sciences at Turrialba, Costa Rica. Plans are being developed to give a year of preparatory work to train students thoroughly in the use of the English language and to provide instruction in phases of study in which the student is deficient in his undergraduate preparation for graduate study. Some courses may be offered on a graduate level, but the primary objective will be to prepare the students for the graduate training they propose to take in the United States or other foreign countries.

This plan has the advantage of giving special training at an institution where the deficiencies of students are already well recognized. It is less expensive than for a student to travel a greater distance to take relatively elementary work which he might better receive before coming to the United States. One of the strong arguments for such instruction by the Inter-American Institute of Agricultural Sciences is that a permanent staff could be maintained for this purpose. It is believed that such an arrangement is superior to trying to give graduate training in connection with the ICA assistance which is being extended to many foreign countries.

There are some decided weaknesses in sending instructors from the United States to offer instructional work under the International Cooperation Administration contracts. In general, few of the personnel employed in teaching capacities under the ICA are willing to spend more than two years outside of the United States. As a rule they have not thoroughly mastered the native language when they go into a foreign country having a language other than English. Therefore, at least during the first year of their stay, lectures are likely to be translated which results in a loss of perhaps 50 percent of their effectiveness. Furthermore, the instructor cannot confer advantageously with students who have not mastered the English language. While the instructor may acquire sufficient understanding of the language to give untranslated lectures during his second year, he is perhaps looking forward to returning to the United States and his instruction never attains the desired effectiveness.

It is the recommendation of your committee that further attention be given to helping prospective graduate students from other countries who wish to pursue graduate work in the United States to become properly qualified, and that special attention be given to the development of plans now under study at the Inter-American Institute of Agricultural Sciences. The principles set forth above may well be applied to students seeking graduate training who are from institutions in other foreign areas where the undergraduate work alone is not adequate preparation for graduate courses in agricultural economics.

A further need is how to assist former graduate students who have now attained teaching and research experience in their home countries to complete their graduate training. Many such men have family responsibilities now, and although they may be eager to resume their studies, lack of financial means

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usually makes it impossible for them to do so without assistance. Some of these men, with their past preparation and experience, with additional training should be effective teachers and research workers.

In the 1956 committee report, it was recommended that foreign students expecting to take graduate work in the United States be urged to spend two or three months in the United States becoming acclimated prior to registration. It was recommended that an institution or group of institutions might set up an orientation period to accomplish the same objectives that the Inter-American Institute of Agricultural Sciences now has under consideration. During the past summer, through the aid of the Council on Economic and Cultural Affairs, Cornell University has undertaken a type of orientation. However, this was extended to students who had already spent a year or longer in the United States, and presumably had become quite well adjusted to study in this country. The Cornell type of work should be better adapted to students after their major study is completed and before they return to their native countries to take up teaching and research duties. The committee feels an orientation course should be designed particularly to assist prospective graduate students to make their adjustment before undertaking graduate study although the objective of the Council on Economic and Cultural Affairs needs to be accomplished and merits further trial and development.

This committee wishes further to emphasize the desirability of the membership of our Association retaining close affiliation with the International Conference of Agricultural Economists. Some discussion has been given to the desirability of offering a joint membership between our Association and the ICAE. Those who have experienced the conferences of the international group will, we believe, support the thought that although the ICAE meets only every third year several contacts with that group have done much to broaden understanding of the instructional needs of foreign students, the problems encountered in other countries, and the necessity of an international liaison between agricultural economic leaders to help smooth the paths of graduate students from United States or other countries who seek part of their training in a foreign land. The major advantages of the ICAE, however, comes to those who are privileged to participate in the conferences and become better informed on world-wide agricultural economic problems.

G. H. AULL

S. E. JOHNSON

K. L. ROBINSON

G. B. WOOD

H. C. M. CASE, *Chairman*

MINUTES OF THE MEETING OF THE EXECUTIVE COMMITTEE AND COMMITTEE PERSONNEL, AFEA  
LAKE JUNALUSKA, NORTH CAROLINA AUGUST 28, 1957

Present: James, Trelogan, Brandt, Ackerman, Timmons, Heisig, Kohls, Turner, Halcrow, Case, Ebling, Williams, Stucky, Nicholls, Clodius, Witt, Diesslin.

1. Timm, Texas A. and M., extended an invitation for the Association to have its Annual Meeting at Texas A. and M. for 1960.

2. Abshier commented on local arrangements. He estimated these costs: (a) advance notices, mailing, programs, supplies, etc. about \$500, (b) reception about \$350, (c) ground fee of \$1 per adult in addition to registration fee. It was estimated that meetings costs and receipts would be about even.

3. The 50th Anniversary Committee Report was given. This was followed by a discussion of whether to celebrate in 1959 or in 1960. The decision was left to the meeting of the new Executive Committee. Witt's report in this area was accepted.

4. Brandt reporting for the Advertising Committee stated that a rate card had been printed and sent out to advertising people three times. He recommended that an advertising committee of five or six members be selected (preferably younger and strategically located as to publisher's locations). Additional ads can be obtained only by personal or phone contact. Mail contact is not practical. The committee should establish personal contact with advertising managers or each publisher. Brandt believes that income from advertising can be increased substantially. Halcrow agreed concerning necessity of committee members in New York, Boston, etc. and the personal contact aspects. Constant salesmanship is needed.

5. Audit Committee report was approved to be presented at the business meeting.

6. Awards Committee report was presented by Nicholls. James moved to accept the report. Carried. The motion specifically included the financial recommendations at the bottom of page 8 of the report.

This discussion of changes in award procedures proposed in report followed:

Page 4, (1a, b) Discussed where authority lay in setting up divisions of subject matter. Ackerman moved that the Awards Committee specifically have the discretion to organize and administer the award program including whatever they consider the appropriate classifications by fields for judging. Carried.

Page 4 (2) Discussed whether the award is to the article or to the person. No action was taken.

Page 4 (3) Brandt moved that the book exclusion provision be changed to permit the inclusion of books and monographs which represent a piece of original research. Carried.

Page 6 Recommendation. Discussed the number of Honorable Mentions (published research vs. thesis present different problems) to be allowed. Committee believes in flexibility for the judges. No action was taken.

7. Case reported for the Committee on Cooperation with Agricultural Economists Abroad. The report was accepted. No action was taken.

8. Ebling reported for the Agricultural Data Committee. (See report and supporting document.) The report was accepted. Discussion of the problem of getting additional economic data needed for research as against the push for additional localized crop and livestock data and increasing county-level data followed. Research needs may warrant more emphasis as extension needs are more adequately met.

9. Financial report was given by Kohls. Ackerman moved that the President appoint an investment committee to advise on the handling of the Association investments. Carried. Ackerman moved that the Secretary-Treasurer with the advise of the Investment Committee be authorized to sell stocks and/or bonds to bring the Association into a desired cash position. Carried.

10. Membership report was presented by Diesslin.

11. Ackerman reported for the Committee on Fellows of AFEA. He reported

ballot tabulation, citations, etc. Proposed revision (see document) was discussed and approved (with noted changes) item by item. Privileges to go with "Fellow," such as free membership, etc. were discussed. It was agreed that the "Fellow" group should be utilized as an advisory committee and helping group for the Executive Committee in the problems of the Association. It was decided that no free membership would be granted.

12. Timmons gave the report for the Student Committee. He reported that participation will be good this year. Charters for students sections are now up to date. Timmons recommended that the rules regarding a three-year term for the chairman of the Student Activity Committee again be followed to assure continuity. The Executive Committee was in agreement.

13. The *Journal* report was given by Halcrow. He reported that everything is running normally. The *Journal* has expanded. The contributed material has remained about the same size. Some increase has occurred in the December and May Proceedings issues. About one-third of the papers are published with minor changes, about one-third with substantial changes and about one-third are rejected.

14. James reported for the Employment Committee. Operation this year was much as in the past.

15. The new president was asked to appoint a committee to look into the situation of more adequately cataloging Ph.D. thesis abstracts, since current microfilm classification does not include agricultural economics.

16. There was discussion concerning the Data Committee in order to strengthen the research demands for data as against extension demands for data. It was suggested that the committee be reorganized to this end of strengthening research viewpoint.

17. Ackerman moved the president write a letter to the Secretary of Agriculture registering the Association approval of the program for improved statistical services being proposed by the U.S.D.A. Carried.

18. A suggestion for obtaining information from AFEA members on agricultural prospects and policies presented by Resources for the Future was discussed. Ackerman moved the president appoint a committee to look into the proposal and report back to the December meetings. Carried.

19. The Executive Committee agrees that ICA material for corresponding memberships be prepared in the Secretary-Treasurer's office and that he be permitted to pay whatever is necessary both in this and other ICA details arising from the contract.

20. The Secretary-Treasurer should bring his recommendations about tax problems to the December meetings.

21. It was suggested that the new Advertising Committee straighten out the billing situation with a definite proposal. Brandt moved to deny any sale of membership lists. Motion died for the lack of a second. Heisig moved to make label list of membership available for sale at \$100. Carried. It was suggested that the Secretary-Treasurer in answering such correspondence point up the alternative of advertising.

22. Ackerman moved that the Handbook be sold at the one price of \$5. Carried.

23. Changes in the Constitution were discussed. Ackerman moved that the Constitution changes be amended to the effect that the Secretary-Treasurer be an appointive office and that he be a member of the Executive Committee. Carried. Ackerman moved that the revised and amended Constitution be pre-



sented to the membership with the Executive Committee recommendation for approval. It was moved and seconded that Page 2, Article 4, Sentence 1 be amended to include the Secretary-Treasurer and to provide that the presidents of other affiliate national or regional organizations serve in an ex-officio and non-voting capacity. Carried.

24. Trelogan moved that the Executive Committee recommend to the membership the adoption of a motion authorizing a charge of up to \$4 to defray the expenses of the annual meeting—the exact amount demanding upon the needs of the host institution. Carried.

R. L. KOHLS, *Secretary Pro Tem*

### MINUTES OF THE ANNUAL BUSINESS MEETING, AMERICAN FARM ECONOMIC ASSOCIATION, AUGUST 30, 1957

President James called the meeting to order at 8:35 a.m. He gave his report.

1. The report of the Secretary-Treasurer was presented and approved.
2. The Auditor's report was presented and approved.
3. Trelogan presented the Executive Committee recommendation and made a motion for authorization of up to \$4 for registration fees at the annual meeting. Carried without discussion.
4. Trelogan presented the Executive Committee recommendation as to the adoption of the revised Constitution. Ackerman moved to amend by striking out "vote of" from last line of Article VI. Carried. Case moved that the Executive Committee be permitted to rectify any errors in the Constitution applying to the appointment of the Secretary-Treasurer. Carried. Nicholls moved that Article VI, Line 3 be changed by substituting word "individuals" in place of "members of the Association." Carried. Nicholls moved the adoption of the revised Constitution. Carried.
5. Ackerman presented the Executive Committee recommendation as to the proposed method of selecting Fellows and moved its adoption. Carried.
6. The Resolutions Committee report given by Bottum was accepted.
7. Timm gave the Teller's Committee report.
8. President James asked that members write to the Secretary concerning deceased members and prepare appropriate resolutions commemorating them.
9. Abshier reported that there were approximately 1400 in attendance—700 members, 300 women, 400 children.
10. President James turned the meeting over to the new president, Harry Trelogan.
11. Announcement was made that a program had been arranged for Philadelphia meetings in December and the next summer meeting will be held at the University of Manitoba, Winnipeg, Canada, August 21-23, 1958.

R. L. KOHLS, *Secretary Pro Tem*

MINUTES OF THE EXECUTIVE COMMITTEE MEETING  
FRIDAY, AUGUST 30, 1957

Present: Trelogan, James, Clodius, Halcrow, Brandow, Penn, Ackerman, Bressler, Kohls.

1. Reprint question. Bressler moved to eliminate the free reprints to authors in the *Journal*. Carried. Penn moved that the President, Secretary-Treasurer and Editor set the price per 100 for reprints at approximately the figure now carried on first line of present rate schedule. Carried.

2. Trelogan suggested Bressler supervise the articles requested in Witt's reports and made suggested personnel assignments. Trelogan and Bressler will work together on the Witt report and the 50th Anniversary celebration.

3. Selection of meeting sight for 1960. Invitations are on hand from Texas, Montana, Purdue, Kentucky, Florida, and Iowa. Penn moved that the President contact Iowa to determine their willingness to host the 1960 meetings and if they are willing, go to Iowa in 1960. Carried. (This motion was based upon the idea that the Midwest is the logical location in 1960, that Iowa's invitation has been on the table for a year or so and that Iowa State would be the appropriate place to complete the 50th-year celebration since the first meeting was held there in 1910.)

4. Trelogan appointed the following Agricultural Policy Information Committee to work with the Resources of the Future request: Daly, Chr., Barton, Halcrow, Brandow, and Ackerman.

5. Trelogan appointed Ackerman to assemble the necessary plaques, brochures, etc. for the Fellows award.

6. Trelogan appointed a Fellows Election Committee: Taylor, Chr. 1 yr.; Waugh, 2 yrs.; Hobson, 3 yrs.; Black, 4 yrs.; and Schultz, 5 yrs.

7. Trelogan appointed Witt to chairman a committee to handle correspondence which may arise from Corresponding Members (as per our ICA contract). This correspondence dealing with problems of a technical nature would be referred to this committee by the Secretary-Treasurer. The remainder of the committee is to be named.

8. The President was instructed to write letters of appreciation to the University of Connecticut for Halcrow's services, and to the University of Wisconsin for Clodius' services.

10. The final decision on moving the office of the Secretary-Treasurer is to be delayed one month.

11. Bressler moved to give Trelogan the authority to spend a reasonable amount of money, if necessary, to tabulate the results of the questionnaire distributed in his presidential address. Carried.

12. The budget was discussed. Brandow moved that dues be raised to \$9 effective January 1958. Carried. James moved that the seven \$250 awards be reduced to \$100. After considerable discussion, it was decided to wait a year and see the results of the added revenue. Motion was withdrawn. Bressler moved the adoption of the budget. Carried.

13. Bressler moved that the Secretary-Treasurer be authorized to pay the Acting Secretary-Treasurer for his attendance at the meeting at the normal policy rate. Carried.

14. Bressler moved that the policy regarding the payment of transportation expenses of the Secretary-Treasurer and Editor to meetings be extended to include the December meetings. Carried.

R. L. KOHLS, *Secretary Pro Tem*

# MINUTES OF THE MEETING OF THE EXECUTIVE COMMITTEE, AFEA, ESSEX HOTEL, PHILADELPHIA, DECEMBER 28, 1957

In attendance: Trelogan, Brandow, Penn, Hardin, Clodius, Heady, Haviland, Ackerman, Daly, Ebling, Campbell.

1. The minutes of the Executive Committee meeting of Friday, August 30, 1957 were read and approved.

2. The Secretary reported that the accounts of the Association were essentially in balance by virtue of having sold stocks and bonds in the amount of \$9,672.92. He further reported a substantial response from the membership to the request that dues might be paid early.

3. The policy of the Executive Committee to make available to each new member of the Association a copy of the Association's Directory was affirmed. Such circulation of complimentary copies will be utilized as a tool by circularizing members by the Association Membership Committee.

4. President Trelogan presented the results of the questionnaire which were obtained at the Annual Meeting of the Association. A summary of these results will be published in *THE JOURNAL* at a later date.

5. Rex Daly made a preliminary report of the AFEA Agricultural Policy Information Committee. The committee consists of Barton, Halcrow, Brandow, Ackerman and Daly, Chairman. Of particular interest to this committee was a proposal from Resources for the Future that the Association collaborate in the production of a questionnaire and in the surveying of the Association membership. Among the issues involved was the question of economists' viewpoints on supply response and production adjustment. After some discussion Penn moved that the committee's report be accepted and that the committee be dismissed. This motion was seconded by Brandow and carried. It was the judgment of the committee that a survey of the type proposed should not be sponsored or collaborated in by the Association.

6. Professor H. C. M. Case raised the question as to whether there was a chance for joint membership between AFEA and the International Conference of Agricultural Economists. As Secretary-Treasurer of the ICAE he raised the question as to conditions under which joint membership arrangements would be favorable. Professor Case was authorized to explore the possibilities of joint membership with the AFEA. It was understood that if a joint membership were developed, payment would need to be on an annual basis and full rates would be charged (a bargain or lower cost joint membership than single memberships was not investigated).

7. Walter Ebling proposed that AFEA offer joint membership with the Agricultural History Society. He further suggested that ultimately the American History Society and AFEA might share joint sectional meetings. At present the Agricultural History Society has some 750 members, publishes a quarterly journal and charges \$5 per year for dues. It does not now have an independent annual meeting. This request was tabled for later consideration.

8. The proposal from the Canadian Agricultural Economics Society that the \$11 joint membership in the two associations be divided \$8.30 to AFEA and \$2.70 to CAES was accepted. The question of bargain rates when two or more associations were involved in one payment was discussed at some length. President Trelogan appointed Vice President Penn and Earl O. Heady to a committee to investigate this practice. They are requested to report back to the next

meeting of the Executive Committee and make recommendations as to whether the practice of discounts on joint memberships should be continued.

9. Ebling reported for the Agricultural Data Committee. His report was accepted with thanks and congratulations from the officers of the Association.

10. President Trelogan announced that William Nicholls will serve as chairman of the Awards Committee this year.

11. Vice President Penn reported on increased interest in student activities of the Association. The Student Activities Committee for this year is: A. G. Ball, Iowa, Chairman; J. C. Gilson, Manitoba; H. W. Halvorson, Wisconsin; R. J. Hildreth, Texas; and W. H. Pierce, North Carolina.

12. Editor Clodius reported on the activities in his office on problems concerning solicitation of advertising and of handling a joint issue of the Canadian and American journals covering the proceedings of the joint summer meeting. Clodius was authorized to work out with the Canadian group a mutually satisfactory arrangement.

13. Hardin reported that we had now received from ICA approximately 170 names of individuals who are potentially corresponding members of the Association. The Secretary's office will issue invitations in January.

14. The invitation of Iowa State College to host the 1960 national meeting of the Association was accepted. The preferred time for the meeting was indicated as August 10-13, Tuesday through Friday, 1960. Earl Heady and the Iowa group will finalize the arrangements and date of the 1960 meeting with President Trelogan. The 50th Anniversary Committee of the Association will assist in developing a program. Apparently the 1959 and 1960 meetings will carry the designation of the 50th year of the AFEA and presumably the 1960 letterhead of the Association will carry appropriate indication of this as the 50th anniversary of the Association.

15. Ackerman recommended on behalf of the Fellows Committee that a supply of certificates for use over the next five years be obtained. Karl Brandt will arrange to have them hand lettered in California and the cost of up to \$450 for certificates and for framing was authorized. The Association will inventory these certificates.

16. The offer of Iowa State College Press to revise the contract covering the product of sale of the volume READINGS ON AGRICULTURAL MARKETINGS was accepted. President Trelogan is to sign the new contract and complete the negotiations with Iowa State College Press. In essence this new contract relieves the Association of financial responsibility and assigns to Iowa State College Press any royalties which may accrue through any future sales of the volume.

17. The proposal of the Membership Committee that certain materials be prepared for inclusion in the January mailing was approved. An extra 1000 copies of these materials are to be printed for circulation by the Membership Committee.

18. Details for the transfer of the office of Secretary-Treasurer from Purdue University to another institution were left in the hands of the President.

19. Nominations by members of individuals who may become candidates for Fellows in the AFEA were carefully considered and a list was prepared for submission to the Fellows Election Committee. The Secretary-Treasurer was instructed to forward this list to H. C. Taylor, Chairman of the Fellows Election Committee. (The Fellows Election Committee consists of F. V. Waugh, Asher

Hobson, J. D. Black, T. W. Schultz, in addition to the chairman.)

20. President Trelogan reviewed in some detail the proposed content of the 1958 annual meeting joint with the Canadian Society at Winnipeg. Details of both arrangements and program are well under way.

21. Change in responsibility of the officers of the Association and possible division of the activities of the Secretary-Treasurer were discussed. The President was authorized to study and to split off parts of the job of the Secretary-Treasurer if this were deemed desirable.

L. S. HARDIN, *Secretary-Treasurer*

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U. S. Dept. of Agri.  
Theodore W. Schultz  
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James Thomas Bonnen

John Alvin Schnittker  
(Honorable Mention)

Yair Mundlak  
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